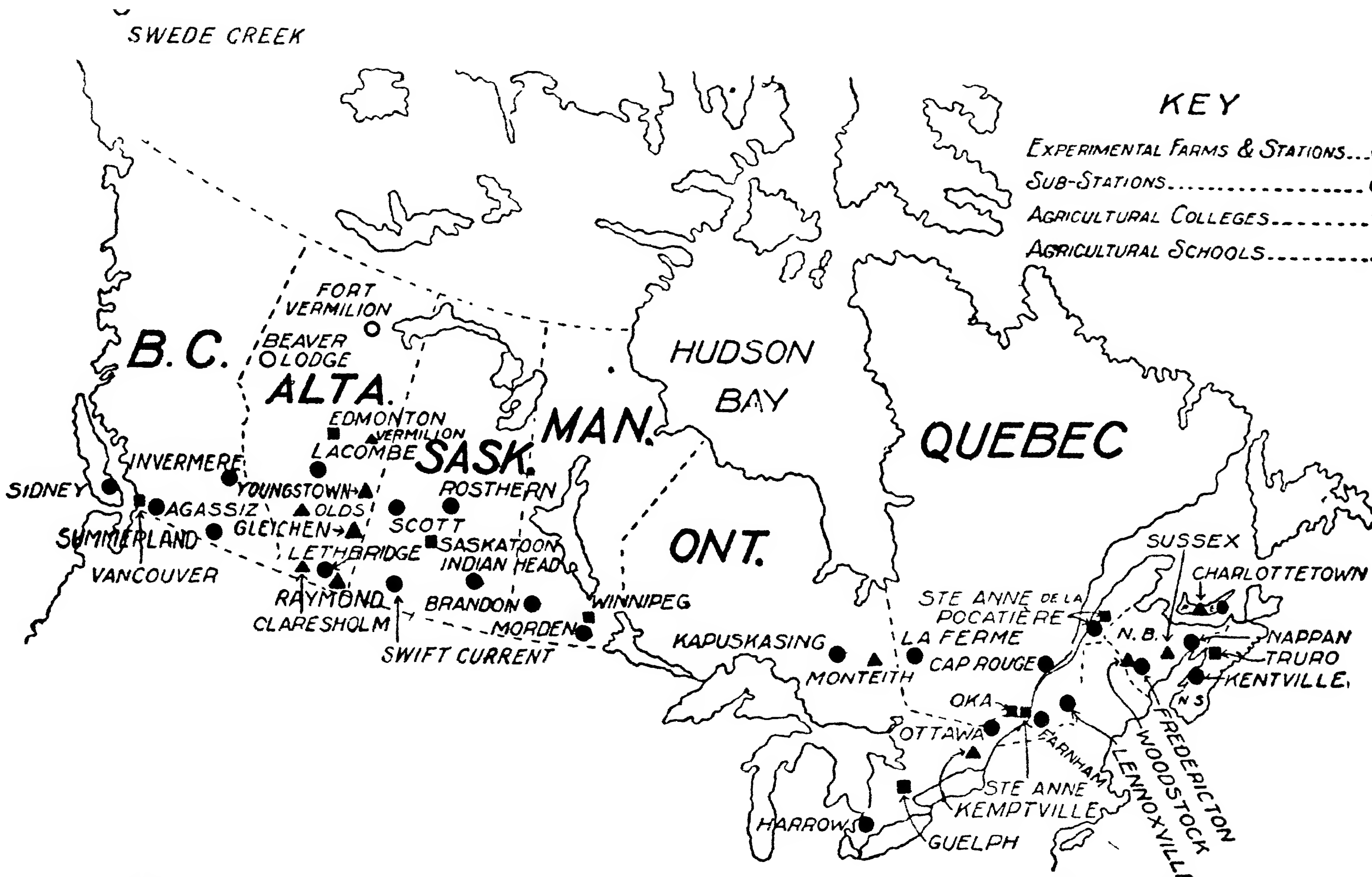
DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 10: No. 1 January-February, 1923

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA



MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART V

THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The AGRICULTURAL GAZETTE
OF CANADA

VOL. X JANUARY-FEBRUARY, 1923 No. 1

THE STATUS OF CANADIAN PRODUCTS ON THE BRITISH MARKET

THE CATTLE EMBARGO

THE Deputy Minister of Agriculture for the Dominion of Canada, Dr. J. H. Grisdale, who was present at the recent conference in England between representatives of the Imperial and Canadian Governments with reference to the removal of the embargo on Canadian cattle, made a statement on his return as to his conclusions on this and other matters concerning the development of Canada's export trade in agricultural products. His comments on the regulations under which Canadian cattle will be admitted to Great Britain, and his conclusions as to conditions in that country, as well as to probable developments here, are all of great interest and importance.

While in Great Britain, Dr. Grisdale took occasion to make a personal investigation as to the position occupied on the British market by Canadian beef, bacon, butter, cheese and eggs, and as to the repute in which they were held. The results are the reverse of reassuring. His conclusion is that, in all directions but one, this country has lost or is losing ground to her competitors. Canadian cheese no longer holds first place; Canadian bacon is below the Danish standard; Canadian butter lacks uniformity; eggs alone have an undisputed position due to government grading regulations.

In addition to pointing to the defects of our products, Dr. Grisdale advances a number of recommendations looking to the improvement of trade conditions. These recommendations, as he points out, in order to be effective, will need the active co-operation of all those interested—the farmer, the cheese and buttermaker, the bacon curer, those engaged in the chilling and freezing of meat, and the Government in its regulatory capacity.

The necessity for a more impressive display of Canadian products being made at exhibitions in the Old Land is strongly stressed, as is the need for the grading and standardizing of products generally.

Dr. Grisdale's statement follows:—

Removal of the Embargo

"The demand for stores is keen in Great Britain, and the number of stores actually being fed at present falls very considerably short of what could be, and would be fed if available. The opening of the British market to Canadian stores will therefore be welcomed by many British farmers anxious to feed, but prevented at present by lack of cattle. If the embargo were once lifted, very considerable business would develop.

"The demand, it must be remembered, however, will be for our well-bred, good-type stores. Inferior or commonplace cattle will get a cool reception, and will very certainly prove a losing proposition to both producer and shipper, as the chances are they would sell for very little more than the freight and other expenses. Unfortunately, there are too many of this inferior type of cattle in

Canada to-day, and it is essential that every farmer interested in the breeding of cattle for this trade, or for beef production in Canada alone even, should see to it that one-half of his herd at least, that is, the bull, is right, before starting operations this winter or next spring.

"It will take a few years to get rid of the too great proportion of inferior cattle, many of them now being put on the market as stockers. There is of course a very considerable percentage of good stuff in the country, and this is the stuff that should go forward to meet this store trade once it is opened up, since it is exceedingly important, and even imperative, that only the very best type of animal should go to this new market if we are to hope to build up a trade and maintain the demand that will make the business profitable to all concerned.

"Once the Imperial Parliament has passed legislation along the lines announced by the Minister of Agriculture for lifting the embargo, the only obstacle remaining will be the high freight rates which now maintain on the railways in this country, on ocean vessels and on the railways in Great Britain as well. Canada is making an effort to gradually lower these transportation costs on her railways; freight rates are coming down to some small extent in January next in Great Britain, leaving the ocean transportation charges the only part of the cost that does not at present show a tendency to decrease. There is no doubt, however, that once a good trade offers, more ships will go into the business, and so compel lower charges through competition which does not seem to exist at present. It is possible, even, that the Canadian Government Merchant Marine might take a hand in this business, and so help put it on a good sound footing.

"Some adverse comment has been noted in connection with the three-day quarantine required in this country previous to embarkation on board ship, but there is absolutely no ground for any anxiety as to the effect of this quarantine on the cost of shipments, since where cattle are shipped direct from, say, Edmonton, Calgary, or even Winnipeg, the quarantine period will be much more than taken up in transit, and even in the case of cattle from Toronto, the day usually required for getting them together, loading, and so on, the day or so in transit and the day in the port of Montreal, make up the necessary three days, and the probabilities are that the quarantine period will not have delayed shipment one hour, nor added one cent to the total expense of getting the cattle across to Great Britain.

"The inspection on this side will, of course, for some time at least, be done by this department free of cost. The inspection in Great Britain will, however, have to be paid for by the shipper, but, as the fee is to be only six pence per head, or eleven cents at the present rate of exchange, surely no objection can be raised.

"It should be noted too that the regulations under which fat cattle are at present admitted for slaughter at certain ports are not to be modified in any way, the only conditions to observe in this connection being that, where fat cattle are shipped as fat cattle, that is, have not complied with the inspection and three-day quarantine under observation regulations discussed above, then no stores or stockers shall go on the same ship with such fat cattle. There will be no objection, however, to fat or half fat cattle going forward as stores, that is, complying with the quarantine and inspection requirements for stores, and then on arrival at the British port going direct to the slaughter house in case they land at Liverpool or Glasgow, if there should be a good market for fat cattle at the time.

"In the case of females, there was at first apparent a very strong objection by the British delegates to their being considered as coming under the category of store cattle, and it was strongly contended that they should submit to a thirty-day quarantine and the tubercu-

lin test before being admitted into the country, but, inasmuch as it was quite apparent to Mr. Marshall and myself, the advisory part of the Canadian delegation, that there was likely to be a very strong demand for grade females, particularly for milk production, the Canadian representatives were most urgent in their demand for better terms in connection with admission of stock of this kind. Finally it was stated that the very most the Imperial Government could concede was that Canadian breeding stock should be admitted, provided they had passed the tuberculin test within thirty days of embarkation, and that they should be subject to the same conditions of inspection as the stockers and spayed heifers, but that the three-day quarantine should not apply, although, of course, that would really make no difference.

"The admission of breeding stock is, however, subject to control by order, hence might be stopped at the will of any Government, or blocked by an adverse vote in the House. This feature was, of course, not very acceptable to the Canadian delegation, but it was maintained by the Imperial representatives at the conference that it was the best that could be done just at present.

"The announcement of this agreement, as it was approved for sending to the British press, made it clear that such regulations as would permit of the admission of breeding stock into Great Britain, would be laid on the table of the two Houses of Parliament, as soon as the enabling legislation was passed, thus indicating clearly that it is the intention of the present Government to implement, by the necessary order, the legislation agreed upon, as soon as such legislation has been passed.

"There was evident, on the part of both the Imperial representatives, and the officials taking part in the conference, the very greatest desire to meet the wishes of the Canadian representatives, and a very strong feeling of amicable co-operation between the Imperial and the Canadian representatives was apparent throughout the whole proceedings. I cannot speak too strongly of the evidently sincere desire on the part of the Imperial delegates and officials to meet the recommendations of the Canadians, or modify their own proposed conditions in such a way as to comply as far as possible with the changes suggested by the Canadian delegation."

Canadian Produce Investigations

"I spent nearly six weeks in Great Britain, most of it in London or the near neighbourhood thereof, attending the conferences in connection with the 'lifting of the embargo' question, but, as may be imagined, I had a good deal of time between meetings which I attempted to spend profitably by looking into our agricultural trade in order to ascertain the actual conditions maintaining on the beef, bacon, butter, cheese and egg markets; the general character of the produce shipped to these markets from Canada and the esteem in which our produce is held by the handler and the consumer.

"It is just a little unpleasant to have to say that according to statements made to me by some of the more important commission men and others interested in such produce as we ship to Great Britain, and to judge by the reputation enjoyed by our produce some few years ago as compared with similar produce shipped by our competitors in Denmark, Holland, New Zealand, Australia, South Africa and Argentina we, in Canada, have not been making quite as much progress in the improvement of the appearance and quality of our exports as have some of the above-mentioned competing countries, since, in many cases, produce from these countries looks better and sells better than similar produce from Canada to-day. It became quite evident to me as I pursued my enquiries and continued to compare Canadian with similar products from one or another of our competing countries that in very many cases indeed were these

competing countries sending goods superior in appearance, at least, to those coming from Canada. One most striking peculiarity in favour of many of the products from our competitors was the uniformity in appearance and quality as contrasted with the great lack of uniformity in appearance and quality in our Canadian products, this applying more particularly, of course, to bacon, cheese and butter.

"In the case of bacon, in which too great a proportion of the sides in evidence were too short and just slightly too thick, as compared with the Danish which easily topped the import market and was usually selling for fifteen or sixteen shillings per cwt. (112 pounds), that is, somewhere around three cents per pound more than Canadian bacon wholesale, and to judge by what I could learn from retail sellers, which was very little, the difference was possibly greater relatively in their case than in the case of the wholesalers.

"Our butter, due to variation in quality is at a great disadvantage as compared with butter from New Zealand and South Australia where the output of individual factories is very great, and where cattle are on grass the year round. The lack of trade names for Canadian butter is a further disadvanatage to our products and a disadvantage that is hard to overcome. In addition, our packages do not seem to be as well made and are certainly not as attractive looking as those coming from our antipodean competitors, and the finish on the butter and the wrapping again show up to disadvantage.

"Our cheese, while still enjoying an excellent reputation can hardly be said to now hold the first place on the British market since, while it may sell for only a few cents less per hundredweight, or possibly the same price even, it is not commonly taken as first choice, the New Zealand article now enjoying that distinction, this being due, it was claimed by some of the commission men, to greater uniformity, to better packages and to a smoother texture, with a cheese slightly less acid coming from New Zealand.

"In reference to eggs I am glad to say that, due to the grading so rigidly enforced by this Department, our eggs enjoy a reputation second to none on the British market and show it by the price they command.

"Our beef varies, of course, greatly from day to day. On one occasion when visiting the Smithfield market, I saw frozen beef from Argentina, chilled beef from Canada, fresh-killed Canadian beef from the lairages at Liverpool, fresh-killed Irish beef and Scotch prime beef all on display. The prices were illuminating. Canadian chilled shipped from Toronto was selling at 6d. per pound; Canadian fresh-killed from Liverpool at 8d. to 9d. per pound; Irish fresh-killed at 8d. to 9d.; Argentina frozen 3½d. to 4d. per pound; Scotch prime about 14d. per pound, and the Argentina frozen selling at only 3½d. per pound although considered somewhat better finished than the Canadian chilled beef, but it was, however, rather rough, which of course would account in some measure for the very low price.

"The chilled beef, of which considerable quantities have been going forward from Canada for the last twelve or fifteen months, has, I have been credibly informed, not been making any money for the shippers and is, I understand, rather difficult to handle. It is possible that frozen beef, which can be handled much more easily, would prove more profitable than the chilled if it could be de-frosted in such a way as to prevent the leakage or loss of the juices which now always occurs when the meat is de-frosted in the usual short time on the Smithfield or other markets. It would be, in my opinion, highly advisable for us to carry on some experiments in this connection to see if it is not possible, by slow methods of defrosting under more favourable conditions, to overcome this most injurious leakage effect.

"Naturally while learning of the difficulties and setbacks above mentioned, which are now doing not a little to injure our trade and our reputation as producers of first class foodstuffs in the Old Land, I was looking around to learn, if I could, of ways and means of combating these difficulties and to get back for Canada, if at all possible, her previous rather easy domination of the British market, insofar as butter and cheese are concerned, and her better reputation in the bacon market. Since returning I have, therefore, made the following recommendations to the Minister of Agriculture, who has agreed with me as to the importance of this country making every effort at least to maintain our present position and if at all possible better the same on the British market, and he has accordingly approved my recommendations in this connection:—

Recommendations for Trade Promotion

"(1) That we appoint a first class business man with a wide knowledge of agricultural products to act as Canada's representative in Great Britain in connection with our bacon, butter, beef, cheese and egg exports; (*a*) to study conditions; (*b*) to make recommendations to our Government and to producers as to how improvements can be brought about; (*c*) to help trade by judicious propaganda in connection with our products in the Old Land, and, (*d*) to be of use as a referee when necessary in trade disputes.

"(2) That we, as a country, make more effective displays at shows and exhibitions of one kind and another, and participate more enthusiastically in such large exhibitions as may be organized or engineered from time to time in the Old Land. We should, I believe, have good and attractive exhibits of Canadian products at the Royal Agricultural Show, and at the Highland Agricultural Show, the two greatest live stock shows in Great Britain, as well as at the London Dairy Show usually held in October, at the Fat Stock Show held in November or December and at the Fruit Shows held at various points from time to time. My reasons for this recommendation are that at two shows which I visited, viz: the London Dairy Show in October and the Fruit Show on the last days of October and first days of November, the advantages of a good display as contrasted with a poor one were very strongly indicated.

"At the Dairy Show, Canada was most remarkable for the very insignificant part she played and for the poor standing taken by her products in butter and cheese. The only booths representing Canada were from Ontario and Quebec, and even these, I am sorry to say, compared very unfavourably with the displays staged by some of the other colonies. South Africa, New Zealand and Australia were the topics of discussion on all hands. It really was anything but a pleasure for a Canadian to wander about that show and observe what was going on and listen to discussions among the commission men and citizens generally. There was absolutely no reason why Canada might not have taken a high place in the competitions and have had displays quite worthy of her actual performance, and even of her possibilities as a country where the very best butter and cheese, bacon, eggs and beef are produced in large quantities and could be produced in much greater quantities if the Government, the interested agencies and the farmers would jointly and individually bestir themselves and take action in the right direction.

"(3) I have to recommend that Canada take a most energetic and large part in the great Imperial Exhibition now being prepared for at Wembly Park, London. I took occasion to visit the grounds where this exhibition is to be held, and was greatly impressed by the preparations under way for this most tremendous Imperial show to be held in 1924.

"Without referring to what other colonies are proposing to do, I may say that an area sufficient to give Canada between three and four acres of floor space is available, and, in my opinion, this whole space could and should be utilized in a striking effort to put before the British people our possibilities as a country where the very best foodstuffs can be produced, and as a country to which the right class of immigration might well direct itself; that is, that kind of immigration interested in the different branches of agriculture. In my estimation, now is the time to begin to get ready for our exhibit at this show since there is only one crop year ahead of us, and material suitable for exhibition purposes is not produced without effort, and well thought out effort at that.

"(4) I am strongly of the opinion that more thorough grading of our products must be brought into effect at once if we are to hold our own. The only product in which we do any grading worth mentioning at the present moment is eggs, and when it comes to eggs Canada ranks highest, next to the home article or the Holland article, which, of course, comes over inside twenty-four hours. Thirty-dozen crates, "Canada firsts," were quoted some shillings higher than American selected eggs, Americans being, of course, our greatest competitors.

"I mentioned the difficulty the dairy produce from our small factories experiences in competing with the uniform article from large factories such as are found in New Zealand and Australia for both cheese and butter. This difficulty, in my opinion, can be very largely overcome if all our dairy products are closely graded into firsts and seconds with sub-grades in each, as, for instance, "Canada No. 1 coloured"; "Canada No. 1 uncoloured"; "Canada No. 1 grass"; "Canada No. 1 fodder," etc., which would give some basis for the commission men and the merchants to work on in the Old Land where now there is absolutely nothing, unless, possibly, the name of a commission man in Montreal or of some co-operative association, which, as everybody knows, means little in so far as uniformity of colour or quality is concerned.

"With reference to bacon, there is no doubt but that the introduction of the grading system for hogs in this country will do much to improve the character of the bacon put on the British market, but I am of the opinion that this is not sufficient. It may possibly be just a little difficult to grade our bacon as it leaves this country, but it appears to me essential that something be done to insure more uniformity in our bacon exports, and some system of grading considerably better than any now being followed by our packers would appear to be necessary if we are to make much progress in this industry.

"(5) We should, I believe, carry on propaganda in Canada along these lines, that is, with reference to the improvement of these products and the importance of insisting upon their being graded as they leave the country, and to impress upon the producer the importance of his doing his part to help.

"(6) In connection with the beef business, the high freight rates maintaining are injuring both the chilled beef and the fat cattle export business. As already mentioned, shipments of chilled beef have, it is claimed by the packers interested, proven unprofitable. It would seem to me highly advisable that an experiment be conducted to determine just where the difficulty lies, and I am recommending that a considerable number, say, a couple of hundred, fat steers be selected, one hundred to be killed and shipped as chilled beef and one hundred to go across alive, and the results observed on the Smithfield market. Such an experiment as this, together with some investigation into defrosting methods, would, I believe, do much to clear up the fog of uncertainty which seems to hamper the development of the beef exporting industry of this country.

Warm Feeling Toward Canada

"In conclusion I would say that while we seem to be struggling along under greater or lesser difficulties in the marketing of our products in the Old Land, there was evident, just the same on the part of the commission man or dealer, on the part of the prominent citizen and on the part of the consumer in all the cities and country districts I visited, fom Southampton to Aberdeen and from Liverpool on the west to Kent in the southeast, a wonderfully warm feeling toward Canada and her people and her products, which augurs exceedingly well, in my opinion, for the development of business and for the getting of immigrants of the right class into this country. My final word, therefore, to the producer and to the people of this country generally is—Canada, wake up! Success and prosperity await our every effort, but mediocrity and failure follow in the wake of the course we now pursue, as there is nothing attained by our competitors as above referred to that we may not equal or surpass."

PART I

Dominion Department of Agriculture

PROFITS FROM MANURE AND FERTILIZERS

Central Experimental Farm Results

BY E. S. HOPKINS, Dominion Field Husbandman

IN Eastern Canada the most important factor limiting the yield of crops is soil fertility. When the soil is poor it rarely, if ever, produces a good crop, but when it is rich, if no accidents arise and good farming methods are followed, a large, and usually profitable crop is harvested. However, it requires expense to enrich the soil, and the paramount question is whether this expense will give such increased crops that a net profit will be made on the investment. It is not merely more crop that is desired, it is more profit.

To answer this question an experiment was started in 1911 at the Central Experimental Farm, Ottawa, in which the profit from farm manure was compared with the profit from commercial fertilizers, comparisons being made also with crops grown on land which received neither manure nor fertilizers. It is believed that the results of this experiment warrant a statement of the yields of the various crops and the profits secured from the applications of manure and fertilizers.

This experiment was conducted in a field divided into four separate areas, each area receiving a different treatment. A four year rotation consisting of mangels, oats, clover hay, and timothy hay was used on each area. On one area manure was applied at the rate of fifteen tons per acre to the mangel crop, nothing being given to the other crops in this rotation. The commercial fertilizers were applied on another area in the following manner: to the mangel crop, a dressing of 100 pounds of nitrate soda, 200 pounds of superphosphate, and 75 pounds of muriate of potash was given per acre; to each of the other crops in the rotation 100 pounds of nitrate of soda per acre was applied. On a third area farm manure was supplemented with commercial fertilizers: the mangel crop received per acre 7½ tons of manure supplemented with 50 pounds of nitrate of soda, 150 pounds of superphosphate, and 37½ pounds of muriate of potash, while to each of the other crops in the rotation 100 pounds per acre of nitrate of soda was applied.

In comparison with the above methods of manuring and fertilizing the land, a similar area was used which had neither manure nor fertilizers applied. The only additional fertility that this rotation secured was derived from the droppings of animals pastured on the timothy hay, this crop, in this rotation, being pastured instead of being cut for hay as was done with the hay in the three previously described treatments. No attempt was made to estimate the gains made by the live stock on this pasture, the area being too limited to pasture sufficient stock to collect reliable figures on this subject.

The experiment was not done in duplicate, but was located on large-sized plots, each crop being grown on one acre of land except the crops on the unmanured and unfertilized plots which were only one-third of an acre in size. The experimental field was of level topography and fairly uniform in the character of its soil.

Summary of Yields

The following table gives the yields of mangels, oats, clover hay, and timothy hay from 1911 to 1920:—

YIELDS OF CROPS—(9-year average)

Rotation Year	Unmanured	Received Manure	Received Fertilizers	Received Manure and Fertilizers
1. Mangels (tons).....	12·0	20·9	19·6	21·0
2. Oats (bus).	44·2	61·2	51 4	52 7
3. Clover hay (tons)	2 0	3·8	3·6	3·7
4. Timothy hay (tons)......	pastured	2·8	2·5	2·8

From the yields in this table, and from the market prices of the various crops, it is possible to determine how valuable per ton has been the farm manure. With a statement of the cost of the various fertilizers throughout the period in which they were used, it is possible to determine the profit derived from the commercial fertilizers. The increased yields on the manured and fertilized land have been converted into money value according to the market price of each crop for each year. Oats and hay have regular market quotations and hence the value of these crops can easily be determined, but mangels being not saleable on the market in large quantities have no quotations and hence have had a value assigned for them.

The reader is requested to examine the two graphs showing "What Manure is Worth," and the "Cost of Fertilizers and Value of Increased Crops." In the first graph it will be seen that the manure has ranged in value per ton from $2.36 in 1914 to $7.45 in 1920. Owing to the high prices received for farm crops in 1918, 1919 and 1920, the manure gave a large return per ton during these years; however, as the experiment was also in progress when farm prices were not high, the value of the manure in those years would indicate its worth when prices are normal.

Commercial fertilizers, it will be noticed in the second graph, gave, as an average of nine years' results, an increased crop valued at $52.02 for an expense for fertilizers of $23.10. This makes a profit of $28.92 on the four crops, or an average profit of $7.23 per acre per year. Taking no account of the additional cost to handle the increased crop, these commercial fertilizers have given a profit of 125 per cent over the expense of their purchase price. It is true that the prices of farm products during the latter years of this experiment were high, but it is also true that the cost of the various commercial fertilizers was correspondingly high in this period.

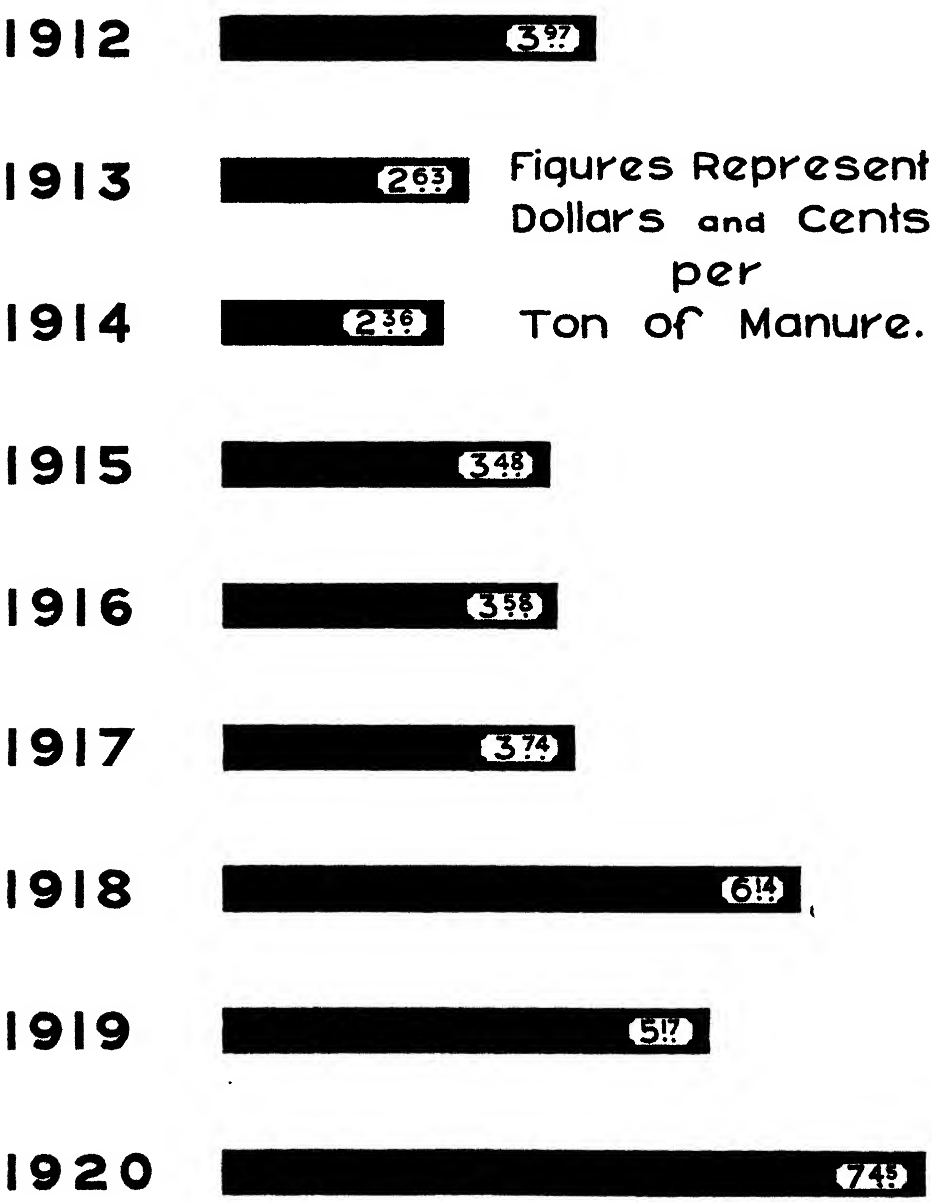
The most important deduction to be made from this experiment is that commercial fertilizers, if economically purchased and intelligently applied, offer a practical means of increasing the profits from land which now receives no added fertility of any kind. In actual experience, only land near the farm buildings receives any manure. The remaining land, variously estimated at from ¼ to ½ the entire area of improved land, never receives any manure at all. It stands in hay for several years, is then pastured for a time, after which it is ploughed and seeded to oats for a year or two; it is then seeded to hay again and the cycle repeated. Under such treatment the land becomes impoverished, often ceasing to produce profitable crops.

What is to be done with such land? It is useless to say apply manure because all the manure which has been produced on the farm has been applied on the land near to the buildings. If fertilizers could be applied with profit to at least a part of this land, larger returns would be made from the farm.

WHAT MANURE IS WORTH

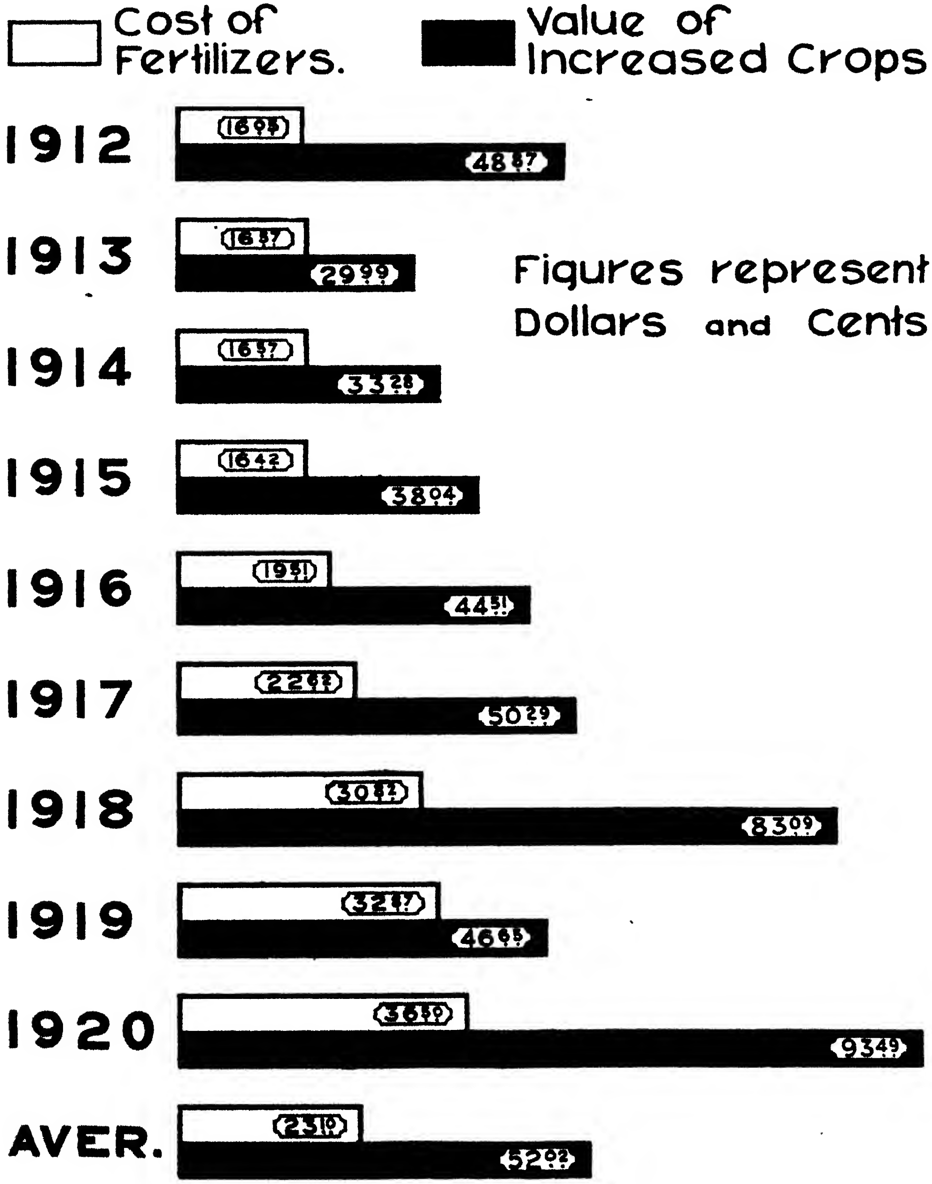
based on

Increased Crops secured



COST OF FERTILIZERS AND VALUE OF INCREASED CROPS

on Fertilizer Rotation



Figures represent Dollars and Cents.

It is not the intention of the writer to deduce that, because excellent profits were secured at the Central Experimental Farm, every farmer could always secure similar profits. On the other hand, however, the fact that such large profits were secured, proves that under certain conditions commercial fertilizers can be used with excellent results. Before purchasing any large amount of commercial fertilizers, it is a wise practice for a farmer to make a small trial in order to learn what fertilizer or combination of fertilizers is profitable on his particular land. If it is not profitable on his own farm, then it is folly to waste money no matter how successful its use has been elsewhere. This is a cardinal point which should never be forgotten.

The next most important point is that the fertilizers should be applied to those crops that are likely to make the largest response. Hay crops, corn and root crops, for example, will respond very much more than will cereal crops, especially oats. To be sure, the cereal crops will produce larger yields on more fertile land, but the net profit is not as large as with the first mentioned crops. How much greater has been the percentage of increase in the yields of hay and mangels than of oats, may be seen from an examination of the table giving the yields under the various treatments.

Furthermore, purchasers of commercial fertilizers should realize that these materials are offered on the market in a great variety of forms and that intelligent care is necessary if the most economical buying is to be made. The value of a fertilizer is dependent upon its composition—upon its content of nitrogen, phosphorus and potash. The market values of these constituents should be known before making any purchases.

The Central Experimental Farm has shown, by a long continued and carefully planned experiment, that both farm manure and commercial fertilizers have given very profitable results. Where the supply of farm manure is not sufficient, the purchase of commercial fertilizers may prove a practical means of increasing the profit from the farm. Nevertheless, while soil fertility is the most important factor in crop production in Eastern Canada (where the results of this experiment are applicable) it must not be forgotten that it alone will not ensure large and profitable crops. To derive the most profit, good rotations should be established, proper cultural methods used, adequate surface drainage provided, tile drainage in valleys or from "pot-holes" constructed, good seed of suitable varieties of grains and grasses used, and, finally, economical farm management applied. With these factors controlled, the addition of fertility to the soil may very materially increase the profit from the farm.

A FUNGOUS PARASITE OF THE IMPORTED APPLE SUCKER, (*Psyllia mali* Schmid)

Artificial Spread of *Entomophthora sphaerosperma*

BY ALAN G. DUSTAN, Assistant Entomologist, Entomological Branch

THE Imported Apple Sucker, as the name indicates, is not a pest endogenous to Canada but is of European origin and was introduced into Nova Scotia, presumably in the egg stage, on nursery stock. Just when this took place is not definitely known, but the insect was first discovered in the orchards surrounding Wolfville in the summer of 1919. At that time it covered a very restricted area but, due to its phenomenal power of increase, spread very quickly and now is found in five counties of this province, namely:

Kings, Hants, Halifax, Lunenburg, and Cumberland. It is not found in any other part of North America.

In order that what follows may be more clearly understood, a brief account of the life-history of the Apple Sucker is given. The winter is passed in the egg stage, on the twigs and fruit spurs of almost all varieties of apple trees. In the spring, when the buds are showing green at the tip, the nymphs begin to emerge and work their way into the opening buds, usually taking up their position immediately beneath the bud scales. Here they feed for a considerable time but when the blossoms unfold they leave this favourite position and enter the opening flowers, clustering in large numbers around the base of the stamens and pistil. They are markedly gregarious and in both the nymphal and adult stages are always found massed together in closely packed groups. Usually during the first week in June the nymphs reach the last stage and soon after that the small green adults make their appearance. They are to be found in myriads in the heavily infested orchards where they can be seen flying in clouds. Egg laying commences late in September or early in October, depending on the season, and continues until the snow flies. Although there is but one generation, the life of the insect extends over approximately seven months.

Natural Control Work

Natural control investigations were commenced in the spring of 1921 and have been continued for two summers. During this time it has been clearly shown that the chief factor instrumental in bringing about a natural decrease in the numbers of this insect is a fungous disease, *Entomophthora sphaerosperma.* Insect parasites are entirely absent in all stages and although various species of ants, birds and spiders take a considerable number of nymphs and adults, they are quite secondary in value compared to the control brought about by the fungus in question.

Entomophthora sphaerosperma Fres.

This is one of our oldest and best known insect-attacking fungi. Unlike many others it is very widely distributed and attacks a great variety of hosts, including members in the following orders: Physopoda, Neuroptera, Hemiptera, Diptera, Coleoptera, Lepidoptera, and Hymenoptera.

In Europe, it has long been recognized as an important enemy of the Apple Sucker but it was not found attacking this host in Canada until the summer of 1920, when it made its appearance in several orchards in the vicinity of Wolfville, N.S. At that time no effort was made to spread the disease artificially as the natural control work was not started until the following year.

The disease develops in the body of the insect in the form of short mycelial threads which at first are found only in the blood of the host. Later, however, the different organs are attacked and, when mature, the fungus has penetrated into every part of the body. At this stage the insect loses its power of locomotion and attaches itself to the under surface of the leaf by means of its legs and beak. The fungus now grows out through the dorsum and forms a dense, flat mass of branching conidiophores, varying greatly in color. The fungus is usually white but quite frequently may be green, blue, and even red in some specimens. The spores are shot off in immense numbers very soon after the fungus makes its appearance externally. These float around in the air and if they chance to alight on another adult, the disease grows into the body of the new host. In this way the fungus is spread from insect to insect.

At certain periods in the development of the disease, resting spores are formed in the body of the adults. Just what condition brings about this change in growth has not as yet been learned but

it is by means of these spores which are found in the bodies of the parasitized adults, also attached to the underside of the leaves, that the disease is carried over the winter.

Artificial Spread

In the summer of 1922 the disease again made its appearance—this time in an orchard in Grand Pré, about three miles east of Wolfville. The orchard was very heavily infested with the Apple Sucker and as a result the fungus made very rapid progress, quickly spreading over all the trees and bringing about an immense mortality.

As soon as it was discovered, an attempt was made to spread the disease artificially over a five-mile area, extending from Grand Pré West, through Wolfville to Port Williams station, chiefly with a view to seeing whether or not the fungus could be made use of on a large enough scale to be of importance economically. Before any of the parasitized forms were transferred, the whole area was scouted in order to ascertain exactly in what orchards the disease was to be found. As a result of this survey it was learned that the infected area was confined wholly to Grand Pré and that there the fungus was present in only three orchards, all of which were in close proximity to one another. Accordingly, the project was started in an area which at the time was known to be free from any outbreak of this fungus and yet was very heavily infested by the Apple Sucker.

At the commencement of the work eight orchards were chosen in the five-mile area over which the experiment was to be carried on. These were all densely-planted, low-lying orchards in which there was to be found a heavy infestation of *Psyllia mali* adults. Check orchards were also selected for the purpose of proving whether the disease arose naturally in this area or whether its appearance, if it did appear, was due to artificial spread. The check orchards were in every case so far removed from the experimental orchards that there was no possibility of diseased adults flying from one to the other.

After the experimental and check orchards had been selected, they were again carefully inspected to make perfectly sure that no disease was present before the work of artificially spreading the fungus was commenced.

In spreading the disease two methods were tried out and as far as could be learned both gave equally good results. These methods were briefly as follows: (1) where leaves bearing diseased adults were collected in fungus-infected orchards and pinned to leaves in orchards to be infected, and (2) where adults still alive and flying were collected in orchards showing the disease and liberated in the orchards under experiment. This last method was tried out only after dissections of flying adults had shown that fifteen per cent of them already carried the disease in the blood stream.

As has already been stated both these methods gave good results and about a week after the first "planting" of diseased adults had been made, the fungus began to appear in the experimental orchards. Once started it very quickly spread and within a very short time was generally distributed throughout the orchards under treatment. At this time no disease had appeared in the checks, proving pretty conclusively that the outbreaks in question were due solely to the artificial spread of the fungus.

As soon as the disease became firmly established in an orchard, no further "plantings" were made there but another orchard was chosen in its place, and so the work increased and extended. In this way it was possible to treat a great many orchards, distributed over the whole area, in a comparatively short time.

Once the fungus gained a foothold in a number of the orchards the insects themselves helped to spread the disease, for it was found that when the epidemic reached a certain point the adults that

were able to fly suddenly left the infected orchard and migrated to neighbouring ones. As a large percentage of these insects were at the time diseased, this was a very important factor in disseminating the fungus.

As a result of this work the disease, which previously was confined to a small area in Grand Pré, is now evenly distributed over a five-mile area in the most heavily infested section of the Annapolis Valley. In this section the Apple Sucker has been practically exterminated and it seems very certain that hardly an egg will be laid there this fall to carry the sucker over the winter. If this is so, it will mean that in this area next spring instead of there being an average of twenty-five or so nymphs in every blossom, as is quite customary, the number will be reduced to almost nothing. This, as can readily be seen, will be responsible for a greatly increased crop and a correspondingly larger revenue from each orchard.

At the present time the Apple Sucker is a pest of economic importance in most of the orchards stretching between Kentville and Windsor—a distance of, roughly, twenty-five miles—where it is instrumental in bringing about a very material decrease in the apple crop each year. During the past summer it was possible to spread the fungus only over a very limited area. Next year it should be possible to make "plantings" of the fungus over the whole area of infestation and in certain seasons, depending to a very large extent on the humidity and rainfall, it seems very probable (judging by the success met with this year) that the disease could be spread and made use of economically in all parts of the province where the Apple Sucker is found. This would not only make for bigger crops but would aid in checking the spread of this insect which has been so alarmingly rapid since its discovery three years ago.

THE DOMINION EDUCATIONAL BUTTER-SCORING CONTEST, 1922

BY GEORGE H. BARR

THE Dominion Educational Butter-Scoring Contest, 1922, covered six months from May to October inclusive. The plan provided that each province should submit a 14-pound box of butter from a different creamery each month and, as far as possible, select creameries that had not competed in the former contests. The creameries were selected by the provincial dairy authorities. British Columbia sent only 4 samples, New Brunswick and Prince Edward Island 5 samples each, leaving a total of 50 creameries in the competition. The samples were expressed to Montreal and placed immediately in cold storage at a temperature of about 15 degrees F.

Of the 50 creameries participating, 33 were new competitors, and it is gratifying to report that the butter from these was of the same type and generally speaking, equal in quality with the creameries that participated in former contests. The percentage of "Specials" was slightly under last year, but the percentage of No. 2 grade was very much less.

The following is a detailed report of the contest:—

Percentage of Samples in each Grade

50 per cent—Special Grade
40 per cent—First Grade
5 per cent—Second Grade

50572—2½

Number of Samples in each Grade by Provinces

Province	Total Samples	Special Grade	First Grade	Second Grade
British Columbia	4	3	1	–
Alberta	6	4	1	1
Saskatchewan	6	2	4	–
Manitoba	6	4	2	–
Ontario	6	2	1	3
Quebec	6	3	3	–
New Brunswick	5	2	3	–
Nova Scotia	6	3	2	1
Prince Edward Island	5	2	3	–
	50	25	20	5

Highest Scoring Samples each Month

Month	Name of Creamery	Province	Flavour	Total Score
May	Yarmouth Cry. Ltd	Nova Scotia	42·0	96·6
June	Belmont Cry	Manitoba	43·0	98·0
July	Vancouver Island Milk Producers' Assn.	British Columbia	43·0	98·0
August	The Sask. Cry. Co. (Moose Jaw)	Saskatchewan	42·0	97·0
August	Eldon Cry	Ontario	42·0	97·0
September	Valhalla Coop. Cry	Alberta	42·0	97·0
October	Crystal Dairy Ltd	Alberta	42·5	97·1

Average Score for Flavour and Total Score by Provinces

Province	Number of Samples	Average Score for Flavour	Average Total Score
British Columbia	4	41·375	96·30
Manitoba	6	41·333	96·02
Alberta	6	41·083	95·78
Nova Scotia	6	40·783	95·40
New Brunswick	5	40·640	95·34
Quebec	6	40·583	95·36
Saskatchewan	6	40·420	95·10
Prince Edward Island	5	40·200	94·82
Ontario	6	39·500	93·98

Standing by Provinces

Valuing first place at 9 points, second at 8, third at 7, fourth at 6, fifth at 5, sixth at 4, seventh at 3, eighth at 2, ninth at 1, and where there is a tie dividing the value of the two places by two the standing by provinces is as follows:—

Alberta.—6 samples. 39 points—2 first, 1 second, 2 fifth, 1 seventh.

Manitoba.—6 samples. 38 points—1 first, 1 second, 1 third, 1 fourth, 1 fifth, 1 seventh.

Nova Scotia.—6 samples. 35 points—1 first, 1 second, 1 fourth, 2 fifth, 1 eighth.

Quebec.—6 samples. 35 points—4 thirds, 1 fourth, 1 ninth.

Saskatchewan.—6 samples. 28 points—1 first, 1 third, 2 sixth, 2 eighth.

British Columbia.—4 samples. 25½ points—1 first, 1 second, 1 tie fourth and fifth, 1 seventh.

New Brunswick.—5 samples. 24½ points—2 fourth, 1 tie fourth and fifth, 1 sixth, 1 seventh.

Ontario.—6 samples. 20½ points—1 first, 1 tie sixth and seventh, 1 seventh, 2 eighth, 1 ninth.

Prince Edward Island.—5 samples. 20½ points—1 second, 2 sixth, 1 tie sixth and seventh, 1 ninth.

NOTE.—The September sample from Prince Edward Island was not received in time to score in September. When scored on November 8, it took 6th place, which changed the standing as given in the report for September samples as follows: Prince Edward Island 6th, Manitoba 7th, Saskatchewan 8th, Ontario 9th.

Standing for workmanship by provinces based on the scores for texture, incorporation of moisture, colour, salting and packing. Total 55 points.

Province	Average of Scores	
British Columbia	54·92	points
Quebec	54·78	"
Alberta	54·70	"
New Brunswick	54·70	"
Manitoba	54·68	"
Saskatchewan	54·68	"
Prince Edward Island	54·62	"
Nova Scotia	54·61	"
Ontario	54·48	"

Texture.—The prominent defects are again brittleness and slight greasiness. It is gratifying to note, however, that there is a decided improvement in the texture over last year.

Incorporation of Moisture.—There is also a decided improvement in this over last year.

Colour.—Only two samples were streaky, the balance of defects in colour were uneven or slightly uneven.

Salting.—Only two samples were salted too heavy, which is a decided improvement over previous years. The Canadian markets are gradually coming to require a mildly salted butter and butter for export must contain less salt than most creameries are using at present. 1 to 1½ per cent in the butter is quite enough for the British market.

Package.—Three samples were scored down on finish for broken tops. Some buttermakers claim that this is caused by drawing the parchment paper too tightly on the butter when wet and when it dries, shrinks and breaks the butter at the edge of the paper.

Pasteurizing.—Three samples showed a strong reaction on the Storch Test. Two of these were reported to be heated to only 160 degrees and held for 15 and 20 minutes. The other report gave no pasteurizing temperature. All the other samples were made from cream heated to 168 to 185 degrees and held from 10 to 30 minutes.

MILK UTILIZATION SERVICE

THE new light that has been shed in recent years on the whole subject of nutrition has placed dairy products in a very favourable position, and the public is entitled to have this information placed before it by fair and distinterested authorities. In November, 1921, the Dairy and Cold Storage Branch of the Dominion Department of Agriculture undertook educational work on the food value of dairy products, with a view to disseminating in various ways information as to the valuable nutritive and protective qualities of milk and its products and their relative cheapness as compared with other foods. This work bears a close relationship to public health, and has the endorsation and approval of the Dominion Department of Public Health.

It is the policy of the Dairy Branch to work as closely as possible in co-operation with the existing citizens' organizations such as Child Welfare Associations, women's and men's organizations, rural and urban, school boards, municipal and provincial departments, etc. The following report shows as concisely as possible the direction of effort and what was accomplished during 1922.

Publications

The following series of pamphlets has been issued:—" Why and How to Use Milk "; " Why and How to Use Cream"; " Why and How to Use Buttermilk "; " Why and How to Use Skim-Milk "; " Why and How to Use Cottage Cheese."

The demand that arose for these publications indicates that they were appreciated not only by the housewife, but by members of the medical profession, social workers, teachers, and organized men and women, who have requested large numbers for distribution. No charge was made for them and, judging from the demands, the first edition of 100,000 copies will be inadequate to meet all requests.

Exhibits

During 1922, exhibits were arranged for at Ottawa, Regina, Toronto and Montreal. At three of the exhibits a demonstration on the preparation of dairy dishes was given and proved an interesting and instructive addition.

Information was forwarded to public health nurses, institute workers and others, and assistance was given in arranging similar smaller exhibits at local fairs, as well as in other ways. These exhibits have been useful in emphasizing the comparative food value and economy of dairy products and their special functions in the diet of children and adults. That they are worth while is proved by the interest taken by visitors and the subsequent inquiries for information on the subject.

Owing to conflicting dates, it was impossible to accede to requests for exhibits from several organizations, among them the Extension Service of the University of Saskatchewan, and the Association des Medicins de Langue Francaise de l'Amerique du Nord.

Addresses

Addresses were given at conventions of Dairymen's Associations; at Women's Institute conventions, short courses and meetings; at Home Economics clubs; Women's Press clubs; men's organizations; short courses for soldier settlers' wives, and at many other local meetings. The programme included addresses to *producer* and *consumer*, and the topics dealt with comprised the food value of milk; the necessity for careful handling on the farm, in the dairy and in the home; the relation of milk to good health and to good citizenship.

Connections Established

Connection and co-operation were established with provincial and municipal Departments of Health and Education; with national and local Child Welfare Associations; with Women's Institutes and other organizations of farm women, such as Cercle de Fermieres and United Farm Women of the different provinces; with Schools of Household Science; with Dairymen's Associations; with normal and public school teachers, and numerous local organizations. The Roman Catholic clergy in Quebec have shown an interest in the work by the heartiest cooperation in distributing publications and information among their parishioners.

REGISTRATION OF THE SILVER BLACK FOX

BY W G. CHURCH, V.S., Chief Inspector

THE rearing of wild fur-bearing animals in captivity for their pelts has been carried on for a number of years in Canada and now holds an important place in some of the provinces. This is particularly the case in Prince Edward Island where, in the year 1921, the revenue received from the black fox industry was as great as that of all the agricultural products and fisheries combined.

Other wild animals have been tried, and although in most cases they could be raised at some degree of profit, they are fast giving way to the Silver Black Fox. This fox is not only easily reared but gives a much greater return, and to-day, after nearly forty years of improvement in ranching conditions and wise selecting of breeding stock, some beautiful animals are to be found in the ranches in different parts of the country.

The animals of this breed are fast becoming domesticated, and it is quite a common thing to see individuals that will eat out of the keeper's hand, while others are so tame that they can be picked up and carried about.

In the year 1915 the Prince Edward Island Fox Breeders' Association was formed in order to keep some record of breeding and with an idea of furthering the best interests of the industry in other ways. The results were good as far as they went, as better records were kept by the breeders and other good work was done. Still, some of the more progressive and enterprising breeders recognized the possibility of improving the system and urged that higher standards be set for foxes that were to be registered, and also that a brand or mark be put on foxes as a means of identification.

In the fall of 1919, these men proceeded to Ottawa and took the matter up with the Live Stock Branch of the Dominion Department of Agriculture and the Canadian National Records. The outcome was the forming of the Canadian Silver Fox Breeders' Association under a Dominion charter and membership in the Canadian National Live Stock Records.

The preparation of the constitution and rules of entry of the Breeders' Association entailed a great deal of work, and it is greatly to the credit of the officers of the Department and Records Association that regulations meeting all the requirements were framed. In this connection it was found necessary to make a separate book for the Alaskan fox, for it has been demonstrated that this is a distinct breed which would not breed true to type when crossed with foxes that were being registered as native-bred foxes. It is also known that there are other distinct breeds of foxes, and when the need is felt, a place is likely to be made for them as well.

In order to get the foundation stock of the Canadian Silver Fox Breeders' Association inspected and registered, the Dominion Department of Agriculture agreed to pay inspectors' salaries until the work was completed. At the present time five men are giving their entire time to the inspecting and tattooing of foxes. One of the rules of the Association is that a fox must measure up to a certain standard as to fur and conformation, and be tattooed in the ears with the breeders' tattoo letters and a registration number. This number is carried through to the registration certificate, so that a person purchasing a registered fox can now identify the fox, as the number on the certificate must correspond with the number that is tattooed in the animal's ear. Another rule provides that animals must show four crosses of true silver breeding in both the direct and collateral lines before they will be accepted as standard; but breeders who

have animals that are not eligible under these rules may still breed up to a standard that will allow them to register by using a registered sire for four generations.

One of the first things done by the Department when undertaking registration work was to send an inspector to make a survey of the different ranches throughout Canada and learn how many foxes in the different ranches would likely be eligible for registration. It was estimated that by the end of 1922 there would be at least eighteen thousand animals registered.

It is not easy to make an estimate of the benefits to the industry that are likely to follow the work of registration and inspection. It is safe to assume, however, that it will lead to the production in the future of much superior animals. This will ensue from the high standard demanded before an animal can be registered, from the prevention of inbreeding, and from the keeping of complete records.

The Department also undertakes to help breeders and prospective breeders to overcome the problems incidental to the breeding of wild animals in captivity. Enquiries addressed to the writer, W. G. Church, V.S., Summerside, Prince Edward Island, will receive prompt attention.

BOVINE TUBERCULOSIS IN CANADA

Control Measures now in Effect

TUBERCULOSIS in cattle is recognized as a serious menace to the prosperity of the cattle-breeding industry and to the welfare of humanity. The insidiousness of the disease in the bovine genus, as in the human, is a serious feature. Every live stock country has suffered from its ravages and has taken steps, great or small, to bring it under control or at least to check its progress. In one way or other millions of dollars have been spent by federal, state, provincial, and municipal bodies with the object of curtailing its ravages. The tuberculin test, discovered less than half a century ago, gave new hope to cattle men, but it also revealed the widespread and prevalent nature of the disease. Certain countries, ambitious for the health of their live stock, undertook with the guidance of the tuberculin test to eradicate the disease. The impracticability of this policy soon revealed itself, inasmuch as the cost of compensation for reactors, if this system were generally applied, was shown to be more than could be borne by the state.

These difficulties could not be allowed, however, to stand permanently in the way of adopting progressive measures, and conferences of international and of lesser scope have from time to time been called to consider and formulate plans to ensure the health of herds and to safeguard the milk supplies. This country, many years ago, began to devise and enforce precautionary regulations through what is now known as the Health of Animals Branch of the Dominion of Canada Department of Agriculture. To prevent the further introduction of the disease into Canadian herds, cattle destined for importation to this country were subjected to test in Great Britain. At a later date—some twenty years ago—a Canadian officer was stationed in England to apply the test there and thus prevent diseased animals leaving the Mother Country for Canada. The latter arrangement soon proved unsatisfactory, and with the approval of the Dominion Cattle Breeders' Association, this officer was withdrawn. Regulations were then put into effect requiring the testing in

Canadian quarantine of all cattle imported from Great Britain. The system is still in force, and requires the listing and permanent earmarking of all reacting animals. The disposal of animals marked in this way is left to the owner, except that they may not at any time be allowed to leave Canada. The effect of this provision is that importers of cattle are careful to ascertain previous to shipment, as far as they are able, that the animals purchased are free from the disease. As a result, for many years the percentage of reactors of cattle imported from overseas has been so small as to be almost negligible.

Canadian herds are protected from infection by the importation of cattle from other countries by a system of inspection and submission to the tuberculin test. The transference of animals to and from the United States is subject to the provisions of a reciprocal arrangement between the two countries. Cattle, six months old or over, for breeding purposes or milk production are admitted from the United States if accompanied by a satisfactory tuberculin test chart dated not more than sixty days prior to the date of entry and signed or endorsed by a veterinarian of the United States Bureau of Animal Industry. Without the presentation of a satisfactory test chart the animals are required to be detained in quarantine a sufficient length of time to be given the tuberculin test. Reactors must either be returned to the United States or slaughtered without compensation. Cattle coming from tuberculous-free accredited herds in the United States are admitted without restriction when accompanied by properly endorsed certificates. Animals seeking admission to the country for exhibition purposes must be accompanied by evidence of freedom from tuberculosis infection.

The Accredited Herd System

The tuberculosis-free accredited herd system had its origin in a Dominion Order in Council passed in April, 1917. It applies to pure bred cattle only. Previous to the year 1922, 12 pure bred animals was the minimum herd that could be entered for accreditation. This number has since been reduced to 10, but must include a herd bull.

Up to the end of November, 1922, 317 herds had been fully accredited. That is to say, the animals comprising the herds accredited up to that date had passed the required tests without reaction. Since the inception of this system more than 1,000 herds have been tested once or oftener with a view to accreditation, and although the test is optional with the cattle owners, the demand for the service has been so great as to require a constant expansion of the testing staff of the Health of Animals Branch.

A condition for entering the test requires that the building in which the cattle are housed shall be maintained in a sufficiently hygienic and sanitary condition to satisfy the official inspector. As early as practicable accepted herds are given the first test, which is repeated in sixty days if reactors are found. If there are no reactors a further test is not made for a period of one year. On the second test, if no reactors are found, the herd is given full accreditation. In cases where individual animals give a positive reaction, they are isolated and earmarked in the same manner as are reactors found at the quarantine station, which consists in cutting a large letter "T" out of the right ear. Reacting animals are either slaughtered or they may be retained under the "Bang System" when permission for such procedure has been received from the Veterinary Director General. If slaughtered animals are found to be suitable for food, and are so certified, they may be sold for beef, the owner receiving the amount realized.

Realizing that reactors need not necessarily be slaughtered, owners are given an opportunity of saving valuable members of their herds. To such animals may be applied the "Bang system." This consists of isolation in suit-

able quarters at a considerable distance from the main herd, no communication being permitted by attendants or material between the healthy and reacting animals. The calves born under the Bang system are at once removed to intermediate premises or to isolated quarters on the healthy herd farm. Before being allowed to enter the healthy herd, they are required to pass two consecutive tests at six-month intervals.

Compensation for slaughtered animals is paid by the Government to the amount of two-thirds of their estimated value which must not exceed the sum of $200. If a herd contains any grade animals, they too must come under test. Compensation for reactors of this class is paid up to two-thirds of a maximum valuation of $60.

To retain full accreditation the herd is required to pass the tuberculin test once yearly. If a reactor is found at any time after accreditation, the certificate of accreditation is withdrawn and the herd removed from the accredited list. Testing is then resumed at sixty-day intervals until reactors are no longer found. The herd is not restored to the accredited list until it has passed three consecutive tests made at six-month intervals without reactors.

Only tuberculosis-free animals may be added to an accredited herd. They may be brought direct from a fully accredited herd, with the approval of the Veterinary Director General, or they must pass the test first on the farm of the seller, and then be isolated on the buyer's farm for a period of sixty days, where a retest is made. If they pass this test, they are admitted into the main herd. If a reactor is found in the herd of the vendor, the animal is earmarked and no compensation is paid.

Control in Restricted Areas

The accreditation system as applied to herds is confined to pure-bred animals except in cases where an owner may have grade stock in addition to the necessary number of pure breds. Regulations have been passed for applying the system on a more extended scale by the creation of disease-free districts. To secure Federal assistance under these regulations, application must be received from the Provincial Minister of Agriculture stating the location and boundaries of the proposed area; approximate number of cattle in the area; that two-thirds of the cattle owners in the area are in favour of having their cattle tested for eradication of tuberculosis; and assurance that the Provincial Government will assist in enforcing the regulations laid down. The restricted areas are to be set apart by proclamation, and are subjected to the same quarantine as applies to accredited herds. Three Manitoba municipalities, those of Roland, Dufferin, and Thompson, have expressed a desire to enter into the scheme.

Showing Animals at Exhibitions

Before accredited animals may be shown at fairs and exhibitions, special provision for segregation is necessary. Two separate sets of segregated quarters are called for: one for animals from fully accredited herds and the other for animals from herds in course of accreditation. Animals of the latter class are admitted only after having (clearly) passed one clean tuberculin test. When brought into the ring these animals must be kept at a reasonable distance from the other stock. A representative of the Veterinary Director General is in attendance at the larger shows to oversee the housing conditions of accredited herds, and the disinfection of stabling previous to occupation.

Municipal Tuberculosis Order

To assist cities and towns to secure a tuberculosis-free milk supply, the Federal Government, in April, 1917, passed the Municipal Tuberculosis Order. The order is not a compulsory one, the option of its application being left to the municipality. A municipality wishing to take advantage of its provisions must

with the consent of the provincial Government first obtain authority by by-law. The by-law, which must conform to the requirements of the Municipal Tuberculosis Order, requires the approval of the Veterinary Director General. The order provides for the classification of dairy herds into Classes "A" and "B." The former must consist of tuberculosis-free animals. From the latter, which are not necessarily subject to the test, no milk can be sold until it has been pasteurized. The carrying out of the order, including the classification of the dairies, is in the hands of the local medical health officer. Dairies that are classified "A" by the medical health officer are given a preliminary survey by an officer of the Health of Animals Branch, and if found to conform to the requirements of the order, the tuberculin test is applied by officers of the Health of Animals Branch. Reactors, if any are found, may be slaughtered, and for these compensation is allowed up to two-thirds of their valuation for animals that show no external symptoms, and one-half of their valuation for "open" cases. Or the reactors may, at the discretion of the owner, be "T"-marked in the ear and quarantined pending disposal. If they are retained, the herd is dropped to Class "B."

At the end of November, 1922, twenty-three towns and cities were conforming to the regulations of the order. These are Moncton, N.B., Granby, Que., Brantford, London, Collingwood, Ottawa, and Smith's Falls, in Ontario, Brandon, Manitou, Minnedosa, Portage La Prairie, Virden, Carman, Winnipeg, in Manitoba; Moose Jaw, North Battleford, Regina, Ogema, Yorkton, and Saskatoon, in Saskatchewan; and Banff, Calgary, and Edmonton, in Alberta.

Owners of dairy herds outside of municipalities in which the Municipal Tuberculosis Order is in effect may receive direct assistance from the Health of Animals Branch to rid their herds of tuberculosis. In such cases the owner is required to comply with the regulations of the Veterinary Director General with respect to testing, quarantining, buying, selling, handling of products, sanitation of buildings, and the avoiding of contact between his and other animals. No charge is made for applying the test, but the owner is required to provide the officer with transportation and board and lodging during the period of his official visit. No compensation is paid for reactors. Reacting animals are all given the permanent identification earmarks.

Still another form of assistance is given to the individual cattle owner who wishes to have his herd tested. If the work is to be done by a local veterinarian, the Veterinary Director General, on application supplies the tuberculin free of charge. The reacting cases are reported to the Veterinary Director General who sends an official to the farm to earmark diseased animals.

Provincial Action

Independent of the Federal Department, the Government of British Columbia has for several years been active in eradicating tuberculosis in the herds of that province. By an Act passed in 1911, all cows are liable, by declaration of the Lieutenant-Governor, to the tuberculin test, and the milk from reacting cows is not allowed to be used. All cattle entering the province are subjected to the test a short time after their admission. The government allows fifty per cent of the value of the animals destroyed; but the amount of compensation must not exceed \$50 for grades and \$100 for pure breds. The system has proved satisfactory; ten years ago 8·50 per cent of the cattle tested gave reactions whereas the percentage is now less than three.

No registered pure-bred cattle may enter the province unless accompanied by a certificate to the effect that they have passed the tuberculin test within thirty days. (See The Animal Contagious Diseases Act, Sec. 82½.)

CANADA'S EGG STANDARDS

BY ERNEST RHOADES, B.S.A., Assistant Chief, Poultry Division, Live Stock Branch

CANADA is the only country in the world with egg standards based on the interior quality of the product. Some other countries have standards, as for instance, Denmark and South Africa, but their standards are based largely on weight. The United States has a multiplicity of standards differing according to the requirements of the particular market. Canadian standards are based on weight, size of air cell, visibility of yolk, firmness of the white, and cleanness. They are defined as follows:—

Specials.—Eggs of uniform size, weighing 25 ounces to the dozen and over, or 47 pounds net to the 30-dozen case; clean and free from stain, strong and sound in shell; air cell small, not over $\frac{3}{16}$ inch in depth; white of egg to be firm and clear and yolk dimly visible. Maximum allowance at time of inspection not to exceed 8 eggs per half case below the grade stated.

Extras.—Eggs reasonably uniform in size, weighing at least 24 ounces to the dozen, or 45 pounds net to the 30-dozen case; reasonably clean, sound in shell; air cell less than $\frac{3}{8}$ inch in dep'h; white of egg to be firm and yolk slightly visible. Maximum allowance at time of inspection not to exceed 8 eggs per half case below the grade stated.

Firsts.—Eggs weighing at least 23 ounces to the dozen, or 43 pounds net to the 30-dozen case; reasonably clean, sound in shell; air cell less than $\frac{1}{2}$ inch in depth; white of egg to be firm; yolk may be distinctly visible but moving freely; air cell stationary but may be slightly tremulous. Maximum allowance at time of inspection not to exceed 8 eggs per half case below the grade stated.

Seconds.—Eggs sound in shell; may contain weak watery eggs, eggs with heavy yolks, and all other eggs fit for food. Maximum allowance at time of inspection not to exceed 6 eggs per half case below the grade stated.

For several years officials of the Department of Agriculture worked on the standardization of eggs, and, in 1915, they were instrumental in having the Canadian Produce Association adopt standards. It was not until May, 1918, that the standards became law, though prior to that time every means was tried of encouraging the trade throughout Canada to apply these standards. In some parts of the country it was possible to get the wholesaler to buy on a "loss off" basis, but even that was not by any means general.

Early in 1915, Great Britain's egg supply commenced to fall off, and it was apparent that Canadian eggs would again find a ready sale in Great Britain. Ways and means were considered of supplying that country with a standardized product and, in 1918, regulations were drawn up under *The Live Stock and Live Stock Products Act*, embodying the standards for eggs and making them applicable to export shipments of twenty-five cases or more, and to interprovincial shipments of one hunded cases or more. The introduction of the standards as a basis of trading for export has resulted in a considerable increase in the popularity of the Canadian egg on the British market.

In the standards, eggs are divided into three classes: fresh, storage and preserved, cracked and dirty. The class for fresh is divided into the grades, specials, extras, pullet extras, firsts, and seconds, and the class for storage and preserved into the grades, extras, firsts, and seconds. Definitions of these grades will be found in the "Regulations respecting the grading and marking of eggs," Canada Gazette, October 7th, 1922.

System of Inspection

The system of inspection followed necessitates the shipper making request for inspection, stating where the eggs are available for inspection and when they will be ready. The inspector then proceeds to that particular establishment and draws from the shipment of eggs a 5 per cent sample in half cases, the shipment having previously been marked with the class and grade of the eggs it contains, and if for export, with the words "Canadian Eggs." An allowance was made originally of six eggs per half case under grade; this has recently been increased to eight eggs. If the inspector finds the eggs up to grade, he marks them with the Government mark, which consists of a maple leaf design, bearing the words, "Canadian Eggs," "Government Inspected," and the inspector's number. The inspector issues certificates, and transportation companies will not move eggs in quantities as above stated unless the shipments are accompanied by the inspector's certificate. It is required in the case of certificates for export that they be marked across the face with the words "Export Certificate." The regulations provide for packing in standard cases. The following is a summary of the export and interprovincial inspections since the egg regulations came into force on June 1, 1918:—

Statement of Inspections. Interprovincial and Export Shipments

	Export		Interprovincial		Total	
	No. Insptns.	Cases	No. Insptns.	Cases	No. Insptns.	Cases
1918 (From June 1 to December 31, 1918)	....	18,553	416	118,595	....	137,148
1919	489	186,690	413	180,168	902	366,858
1920	647	210,862	286	179,557	933	390,419
1921	440	140,155	548	182,544	988	322,699
1922 (For ten months ending October 31)	257	78,813	682	214,900	939	293,713

Imported Eggs Inspected

Complaints have been general for some time past regarding the low grade eggs imported into Canada. In order to check this, certain import clauses have been embodied in the regulations. The law regarding this reads as follows: "All shipments of eggs in the shell imported into Canada for domestic consumption in shipments of ten cases or more shall be subject to inspection and marking at the port of entry by duly authorized inspectors."

It is necessary that such shipments be marked on both ends of each case by the importer with the name of the country of origin and with the words "Fresh Seconds," "Storage Seconds," or "Preserved Seconds," as the case may be, in all instances where the eggs are graded as Seconds by the inspector. The privilege is extended to the importer of recandling the shipment under the supervision of and subject to the approval of an inspector. In the case of these imported eggs, a maximum of twelve eggs to the half case below the grade stated is allowed. When these imported eggs are repacked, it is necessary that markings showing the country of origin and the grade, shall be placed on the cases into which the eggs are packed.

Since these import regulations came into effect on October 7, 1922, the egg inspectors under the Dominion Live Stock Branch have been kept very busy, and it has been found necessary to increase the staff of inspectors. Reports show that the quality of imported eggs arriving from the United States is considerably better than earlier in the season. A car of imported United

States eggs inspected in Ottawa recently in fifteen half cases (225 dozens) showed 99 seconds, 49 cracked and 23 bad, a total of 171 eggs grading seconds and under, in 2,700 eggs. Another car in twenty half cases (300 dozens) showed 111 seconds, 70 cracked, and 23 bad, a total of 204 eggs grading seconds and under, in 3,600 eggs.

Domestic Trade Standards

Apart from the rules governing the shipment of one hundred case lots or more, interprovincially, there is very little in the regulations applying to eggs produced and consumed in Canada. It is thought by some that the application of the standards to our domestic trade might be a good thing. The selling of eggs on grade by retailers in several of the large cities in Canada has been encouraged, and those retailers trying this new method of selling eggs report entire satisfaction to their customers and to themselves.

Investigations were carried on in 1921 and 1922 in connection with the quality of eggs being retailed in Canada, some 1,200 retailers being visited, and the following figures show the necessity for selling on grade:—

Place	Quantity examined Eggs	Specials	Extras	Firsts	Seconds	Cracked	Bad
Toronto..	216	....	....	176	25	....	15
"	720	....	....	....	696	18	6
"	180	....	173	....	....	6	1
"	216	....	....	193	14	9	....
Montreal..	360	....	....	152	202	5	1
"	144	108	33	3	..	.	....
"	360	....	....	267	89	3	1
Ottawa	144	....	10	120	10	4	....
"	150	....	....	....	104	18	28
"	720	106	251	308	38	17	....
Vancouver	360	....	36	321	....	2	1
Winnipeg.	360	....	18	198	114	28	2
Halifax..	360	....	....	280	67	5	8

To encourage the purchase and sale of eggs on a graded basis, an advertising campaign has just been concluded by the Department, covering the significance of grading and the culinary uses to which the different grades may be put. The whole tenor of the advertisements was an exhortation to consumers to buy graded eggs—specials, extras, firsts or seconds—it being pointed out that the consumer's egg problem rested largely in the hands of the consumer.

The only clause in the regulations that may be applied to the retailing of eggs states "That no person shall ship eggs or cause eggs to be shipped or delivered or displayed for sale in cases or containers which are marked or labelled with the name of any class and grade specified in the regulations, unless the quality and weight of the eggs contained therein is equal to or better than such class and grade." This simply means that if a wholesaler or retailer adopts standard grade names in his trading, then he must live up to the letter of the law and see that the eggs sold under those grade names, when candled, will meet the requirements of the definitions of that particular grade as given in the "Regulations respecting the grading and marking of eggs."

THE DISTRIBUTION OF THE EUROPEAN CORN BORER IN ONTARIO DURING THE SUMMER OF 1922

BY L S McLAINE, Chief, Division of Foreign Pests Suppression, Entomological Branch

THE results of the scouting work for the European Corn Borer, carried on in southern Ontario during the summer of 1922, show that although this insect has spread over quite a large area during the past season, the amount of spread is not quite as large as was the case in 1921. It is to be hoped that the latter year was an unusually favourable one for the European Corn Borer owing to the long dry summer and excessive heat.

The scouting was carried on under the same co operative scheme as was adopted when this insect was first found in the province, that is the work was under the immediate supervision of the Canada Department of Agriculture, but the Ontario Department of Agriculture assisted by delegating four men and two Ford cars for the scouting work. A total of fifteen men and five Ford cars were engaged on the scouting, which commenced on July 24, and was completed on September 20. During this period one hundred and sixty-five townships were carefully examined, and of these forty-five were found to be infested by the European Corn Borer.

This insect has spread during the past year over Kent, Essex and Lambton counties, and the important corn-growing area of Ontario may now be said to be infested by this pest. The infestation in the counties mentioned is, fortunately, extremely light, and up to the present time no actual damage has resulted to the corn crop in these areas, although the same cannot be said of the heavily infested districts in Elgin and Middlesex counties. In 1921 a single township (Pickering) was found infested on the north shore of lake Ontario, but the scouting carried on during the past summer adds nine additional townships to the infested area. The greater portion of these have undoubtedly been infested by the natural dispersion of the insect, but the cause of infestation in two townships (Clarke and Brighton) at least, is unknown. The infestations in these townships were very light and isolated, and may possibly have been due to importing infested corn or corn stalks. There was very little spread of this insect in a northerly or northeasterly direction, which may be due to the fact that there is comparatively little corn grown in this area. In addition, the infestation found in the northern territory in 1921 was very light.

The area known to be infested by the European Corn Borer up to October, 1922, is as follows:—

The entire county of Brant, Elgin, Essex, Haldimand, Kent, Lambton, Middlesex, Norfolk, Oxford, Perth, Waterloo and Welland; and the following townships: Culross in Bruce county; Clarke in Durham county; Trafalgar in Halton county; all but Ashfield, Wawanosh East, Wawanosh West, and Howick in Huron county; all but Caistor in Lincoln county; Brighton in Northumberland county; Pickering, Whitby East and Whitby West in Ontario county; Albion, Chinguacousy, and Toronto in Peel county; Guelph in Wellington county; Ancaster, Barton, Flamborough East, and Flamborough West in Wentworth county; and York and Scarborough in York county. A total of one hundred and fifty-two townships covering approximately eleven thousand seven hundred and eleven miles is represented by the above area.

The following table indicates the spread of the European Corn Borer in southern Ontario since its discovery in 1920, together with the number of townships and square miles infested:—

Year	Townships Infested	Square Miles Infested
1920	35	2,780
1921	65	4,910
*1922	7	524
1922	45	3,497
Total to Oct, 1922	152	11,711

* Seven townships were added to the quarantined area in February, 1922, in order to provide markets and straighten the quarantine line.

In February, 1922, the European Corn Borer[1] quarantine was amended, and by this amendment a double quarantine was established, which prevented the movement of corn on the cob, corn stalks, etc., from the heavily infested areas (Elgin and Middlesex counties), to the lighter infested districts. This was done in order to prevent shipments heavily infested with European Corn Borer larvæ being forwarded to newly or very lightly infested areas and thus start up new and possibly heavy infestations on the border of the quarantined area. The advisability of taking this step can best be illustrated by the results obtained from the making of field counts to determine the degree of infestation in different districts. Port Stanley was taken as the centre of this work. Three circles were drawn with a radius of approximately eight, sixteen and thirty miles. Fields of corn were examined at frequent intervals on these circles. The degree of infestation on the inner circle showed a variation of from ten to one hundred per cent, whereas the variation in the middle circle was from seven to seventy-seven per cent, and in the outer circle from one to seven per cent. The percentages were secured by counting the number of stalks infested in lots of one hundred stalks. Three counts were made in each field and the results averaged.

During the summer the quarantine on the movement of corn and corn products was maintained in various ways. Warning notices were posted at all road intersections leading out of the quarantined area. Large banners were placed on the main automobile highways, warning motorists not to take corn from the infested area. Inspectors were stationed at Toronto, Hamilton, Sarnia, and Windsor to watch for evasions in the case of shipments of sweet corn on trains, boats, via express and freight, etc. At Hamilton 15,000 dozen and at Toronto 47,000 dozen ears of corn were examined and traced. When it is realized that sweet corn from southern Ontario goes as far east as Cape Breton, N S., and as far west as Sault Ste. Marie and Port Arthur, Ont., the necessity of keeping a close watch on all shipments of corn to prevent the spread of the European Corn Borer can readily be understood. In addition, a close watch was kept on fall fairs, as it has been customary in the past to send green corn for fodder with exhibits of live stock. The general public is co-operating with the Department of Agriculture in a very gratifying manner, for during the entire season it was necessary to prosecute only six individuals for evading the quarantine by shipping corn on the cob from the quarantined area.

In July, 1921, the United States Department of Agriculture placed a quarantine[2] on the province of Ontario, which prohibited the importation into the United States of certain cut flowers and vegetables unless the same were accompanied by a certificate of inspection stating that the shipment was free from infestation by the European Corn Borer. Between February 15 and November 11, 1922, nine hundred and sixty-five certificates were issued. The articles inspected and covered by these certificates included the following:—

[1] Quarantine No. 2, Domestic, (Revised), Canada Gazette, Vol. LV, No. 34, Feb. 18, 1922, page 3440.

[2] Notice of Quarantine No. 41, with Regulations (Revised). United States Department of Agriculture, July 21, 1921.

Oat and Rye Straw..	440 tons
Cut Flowers..	2,059 dozen
Beets with tops..	26,850 dozen bunches
Rhubarb..	200 dozen bunches
Beans (Green)..	3,060 bushels
Celery..	290 crates
	100 acres inspected in the field
Spinach..	115 bushels
Miscellaneous Plants..	150

In regard to the European Corn Borer infestation in the United States, it may be said that, since its discovery in 1917, the insect has spread over a large area, and particularly in Massachusetts, has been responsible for a great deal of damage not only to corn but also to other crops. When first discovered in Massachusetts, Vinal[3] reports corn as "the only valuable commercial crop seriously attacked by this pest." He mentions it as also attacking pigweed, barnyard and foxtail grass and dahlia stems. But conditions have changed and the insect is now doing serious damage to beets, celery, beans, chrysanthemums, etc. In fact the list of host plants in the Massachusetts area is now one hundred and seventy.[4]

[3] S. C. Vinal, The European Corn Borer. Bull. 178, Mass. Agri. Experiment Station, December, 1917.

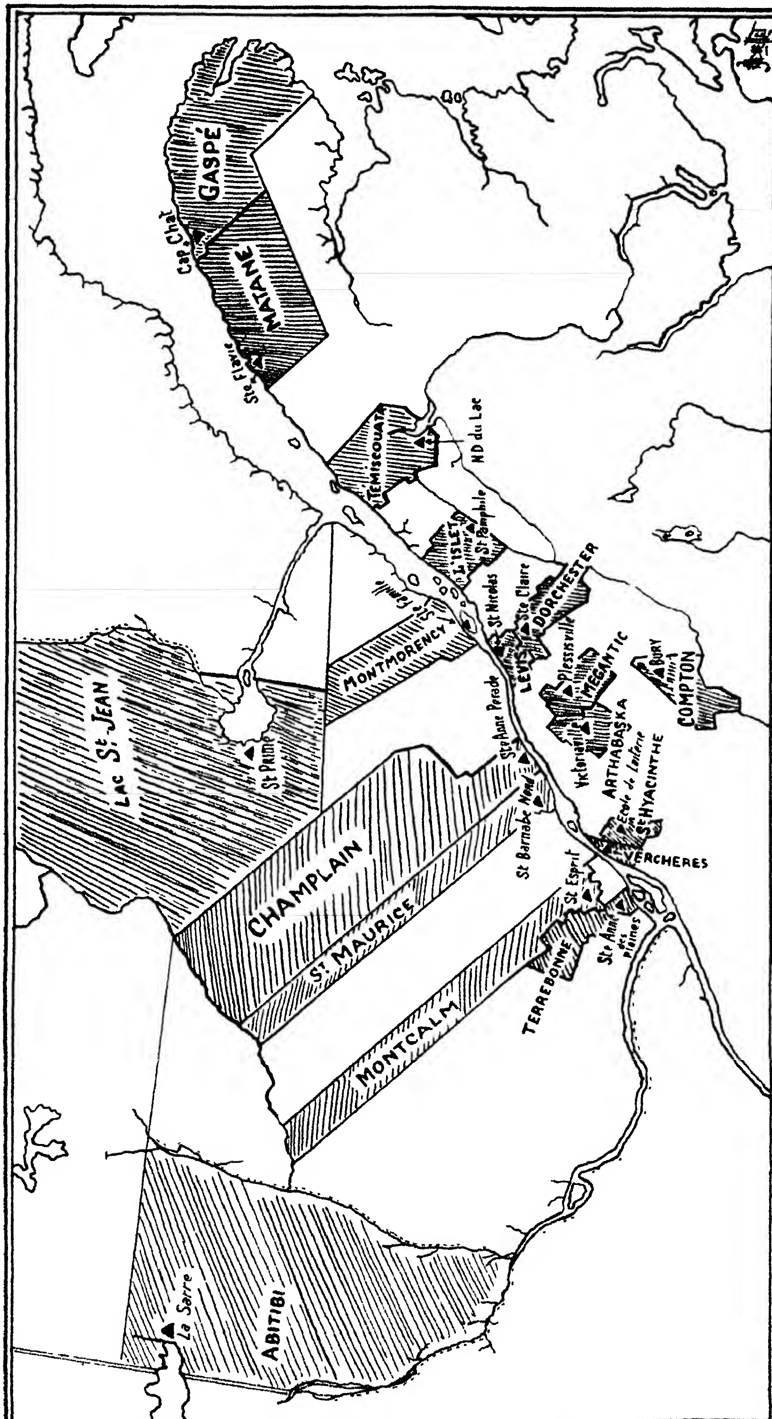
[4] E. P. Felt, The European Corn Borer, Extension Bulletin No. 31, N.Y. State College of Agriculture, Revised March, 1922.

[5] W. N. Keenan, The Distribution of the European Corn Borer in Canada and the United States. Ann Rept., Que. Soc Prot Plants, 1921-22. Also from Quarantine No. 43 of the United States Department of Agriculture (2nd Revision), May 1, 1922, with amendments to Nov. 16, 1922.

The following table illustrates the spread of the European Corn Borer in the United States[5]:—

Year	No. Twp. Inf	States Infested
1918	32	Massachusetts
1919	122	Mass southern New Hampshire, central and western New York, and Pennsylvania (1)
1920	105	Mass , N H , and N.Y.
1921	127	Mass , N.H.. N Y., Penn., Ohio and Michigan.
1922 .	177	Mass , N H , N Y., Penn , Ohio, Mich., Maine, and Rhode Island.

Now that the European Corn Borer has invaded the corn growing sections of Ontario, it is to be hoped that it will continue to confine its activities to corn and not attack other plants to the same extent as it has done in Massachusetts. Up to the present time in Ontario, corn has been the only plant seriously injured; but time alone will solve this question.



Map showing distribution of the Demonstration Farms of the Quebec Department of Agriculture

PART II

Provincial Departments of Agriculture

THE DEMONSTRATION FARMS OF THE QUEBEC DEPARTMENT OF AGRICULTURE

Their place in the scheme of agricultural teaching; their object and method of working

BY L. PHILIPPE ROY, Chief of the Field Husbandry Division

THE first demonstration farms of the Quebec Department of Agriculture were established in 1920. Eighteen of these farms are actually being worked, and as their number increases from year to year, it is probable that before long most of the counties of this province will have one of these practical farms, serving as an object lesson for the farmers of the district.

The teaching of better farming methods, given on a large scale throughout the province until the last few years, and especially during the last decade, seldom went beyond the lecturing stage, sometimes accompanied by demonstrations and practical work, bearing, in most cases, only on one phase of agricultural production.

Of course, there were the experimental farms and other agricultural institutions established for the purpose of making comparative tests of the different varieties of plants or of methods of farming and sending out the results of these tests to the farmers. District agriculturists could avail themselves of this teaching and make it known to the farmers of their districts. This was a very valuable work, which has greatly helped the progress of agriculture in our province during the last few years.

One thing was lacking, however: there was need of a system of teaching, based on the evidence of facts, in order to convince the farmer; there was need of a farm similar to the average farm, improved and worked in the presence of the farmer and by methods that he could afford to follow. In order to secure the confidence of the farmers of their districts and establish their own prestige, it was necessary that the agriculturists should have a piece of land where they could demonstrate the value of their teachings, and show what they could do, by comparison with practical farmers.

Lastly, in order to complete our system of agricultural teaching, there was need of a connecting link between the farmer and our technical institutions or, in other words, some way of transforming agricultural teaching into practical teaching and object lessons.

Under good management the demonstration farms scheme should fill this need. It is looked upon with favour by the agriculturists in particular and the farmers in general.

It is necessary that a distinction should be made between *experimental farms* and the so-called *demonstration farms* of the Quebec Department of Agriculture. In order to avoid any confusion, a brief description of both terms is given here:—

The experimental farm, as the name implies, deals with rather technical work, research work, comparative tests suggested by science with a view to improving breeds of live-stock, the

methods of farming and adapting the same to certain districts or certain conditions. Such experiments require a highly trained staff and special equipment. The least discovery may repay its cost a hundredfold, no matter how high that cost may be, through the improvement that may result from its application to the farms of a district or of a county.

The demonstration farms, on the other hand, do not deal with tests or research work; they are only the continuation of the experimental farm and should be the last phase in agricultural teaching. Their purpose is simply to demonstrate the best known agricultural methods. For instance, the very first year that a demonstration farm is established, it will grow varieties that may have required several years of work and selection on experimental farms or agricultural colleges. The demonstration farm is nothing more therefore than an ordinary farm, well managed, according to the requirements of the soil, of the crops and of the markets.

Such is the plan under which the Minister of Agriculture, Honourable Mr. Caron, has decreed that the demonstration farms should be conducted. Knowing by experience the many problems that face the farmer, he is endeavouring to solve these problems by placing these farms in the most representative points of the districts that they are to serve.

The farm as a whole is under the direction of the officials of the Department of Agriculture. Endeavours are being made, in the first place, to run it on a paying basis and according to methods suggested by agricultural science and sound economy.

The demonstrations deal with the three main factors of production in mixed farming: soil, crops, live stock. The adoption of a suitable rotation, the thorough preparation of the soil, the scientific distribution of crops, the choice of the most productive varieties, the keeping and use of manure, the reclaiming and underdraining of land when necessary, the improvement of herds and flocks, the maintenance of farm buildings, of agricultural implements, etc., such are the main lines on which the scientific management of each of these farms is based.

However, attention should be called to the fact that the first and most important improvement on the demonstration farm is the adoption of a suitable rotation. We believe that the demonstration should stress this point particularly. Although the theory and importance of rotations are well known to the general farming public, it is surprising to see how few farmers have put this teaching into practice. The impossibility of growing hoed crops on a large scale, the lack of fertility in the soil, and the lack of farmyard manure, have often been advanced as arguments against the adoption of crop rotations on Quebec farms. As a matter of fact, these things are the chief handicaps under which we are labouring in the management of these demonstration farms, because, in a great many cases, the general method of farming in the province tends, in a general way, to lower the fertility of the soil. It should be noted, however, that on each of the demonstration farms established so far, all of which are typical of the average farms of the district as regards soil fertility, there has been no difficulty in establishing a suitable rotation. Rotations of five or six years are the best at the start, on account of the system of farming recommended in the district and the labour and the quantity of manure available. It is quite possible, however, that shorter and more productive rotations may be followed later on, at least where conditions permit. As the present system of farming in Quebec is characterized by the maintenance of large areas in pastures and meadows of short duration, often yielding poor crops, it would not be advisable to attempt a sudden transformation through the adop-

tion of shorter rotations, requiring the growing of hoed crops on a large scale and the use of large quantities of manure.

It is claimed by practical experts—and this claim has been confirmed by our own observations—that this "hoed crop problem," that is, the introduction of a cleaning crop in the rotation, can best be solved by the growing of silage crops such as corn and sunflowers, or of roots and fodder plants, including clover. Furthermore, the use of well kept farmyard manure, supplemented by the best chemical fertilizers, makes it possible to rapidly improve such farms and restore the fertility of their soils.

The selected seed supplied for the start to these demonstration farms is also one of the very best investments and one of the most convincing demonstrations that could be made. In many cases there has been, on this score alone, a material increase in the yield of crops.

It often happens that we have to change almost completely the divisions of a farm in order to make them simpler and more convenient. Such changes often include the levelling of fields and the draining of wet areas. The placing of a few drains in the wettest spot of the farm often makes it possible to grow successfully all the crops in the rotation, which is a very great advantage. These small demonstrations on drainage will probably encourage a greater number of farmers to drain their wet soils.

It should also be stated that summer ploughing such as done on these farms, is a fundamental operation in the preparation of the soil for hoed crops. Summer ploughing, which may be done on almost all farms, powerfully helps in the destruction of weeds and in improving the tilth of the soil.

A book-keeping system, specially devised for the control of farming operations, has been adopted this year on every one of these farms. Each operation may thus be studied in the light of facts and figures, and the receipts and expenditures of each branch may be compared. As an adjunct to this system, and with a view to securing figures on the cost of production of certain crops, we have also begun to record the cost of standard crops. We will know therefore, the cost of an acre in potatoes or of any other crop in a given district and the receipts for the same.

It would be difficult and probably rash to give a fair estimate of the methods that have so far been followed on these farms. To be really useful and convincing, such teaching must be based on a great number of annual tests, carried on in many different places. There is no doubt, however that, although they may not all yield fruitful results, these experiments, carried out repeatedly as they are in all the districts of the province of Quebec and under all sorts of conditions, will yield valuable data, which have so far been lacking because there was no practical organization for securing the same.

The success that these demonstration farms has met with from the start is largely due to the co-operation and the efficient work of the district agriculturists who have greatly helped the field husbandry division in the supervision of operations in their respective districts.

Particulars of Management

The farm of a practical farmer is chosen for the purpose. Under an agreement, renewable every five years, and providing for a remuneration based on the number of years under cultivation, the farm passes under the management of the Field Husbandry Branch of the Department of Agriculture. The Field Husbandry Branch works in close co-operation with the district agriculturists. The latter are consulted on the choice of the farm. Their knowledge of the particular needs of their district is put to good use. They must see that the farmer observes the conditions of the agreement, and they supervise the work and supplement the instructions given by the officials of the Field Husbandry Branch.

The area of the farm may vary from 40 to 100 acres; it must be easy of access, and in preference, on one of the main roads of the county. Each of these farms is under a system of mixed farming, which is doubtless the most profitable for the majority of the farms in the province.

The superintendent of a demonstration farm must improve his herds and flocks by the use of pure-bred sires. He must also record the production of his cows and keep the farm buildings in good sanitary condition. The department also insists on the adoption of a suitable rotation on each farm, and on the selection of suitable varieties for each crop. The farmer receives a special grant for every important improvement made on the farm, such as underdrainage, etc. These grants are always in proportion to the effort displayed by the farmer to improve his farm.

The district agriculturist is kept well posted on all the methods recommended and practised on the farm. He keeps a copy of all the correspondence exchanged between the Field Husbandry Branch and the farmer, so that he may always see that instructions are duly carried out.

Such is the demonstration farm policy of the Quebec Department of Agriculture. These farms cannot be expected to give prompt and complete results, as all things in agriculture are subordinated to several factors over which man has little or no control. Progress must follow its normal course and not go beyond what may be achieved by a farmer left to his own resources. The draining of the soil, the restitution of the soil fertility, the destruction of weeds, the improvement of herds and flocks, etc., require time and persistent efforts, in addition to capital expenditure. We must therefore beg the agricultural class to wait patiently for results.

One of the Demonstration Farms of the Department of Agriculture of the Province of Quebec.

COMMODITY CO-OPERATION IN ONTARIO

BY W BERT ROADHOUSE, Deputy Minister of Agriculture

OF all the forms of co-operation the application of this principle on a commodity basis has perhaps proven the most successful. Started in Denmark and adopted in California, it has produced splendid results and is spreading rapidly to many other sections. The basic principle is the bond of common interest that exists between a large number of producers of the same commodity. By bringing together the product of a large number of small producers of the same article, a large volume of business is secured, and thus it is possible to put into practice the very best distribution and the most progressive methods of merchandising. Briefly stated, these are the basic principles, and it will be readily agreed that the basic principles are sound.

In Ontario the idea of co operation on a commodity basis is comparatively new, and what is known of it is due very largely to the efforts of the Honourable Manning Doherty, Minister of Agriculture, who has devoted a great deal of time both to the study and presentation of the subject. The principle has been given effect in the organization of the Niagara Growers for the co-operative marketing of tender fruits, and there is now in progress a movement to effect a similar organization of the dairymen of the Province. As there are a very large number of dairy farmers in Ontario, and as they are scattered in all sections of the Province, it is a very big proposition and one which cannot be carried through to a final success without a great deal of educational work.

The movement has developed gradually and naturally. First there was a general dissatisfaction of producing dairymen in witnessing the violent fluctuations in the prices of cheese, and on this account, as well as on account of other experiences, there was a desire to effect some better method of marketing their product which would give them full control. Several conferences of leading dairy producers were held, and the net result of each discussion was the determination to effect a large central marketing organization which would be big enough to exert a real beneficial influence on the industry. At the last session of the Legislature, the Minister introduced a Bill which incorporated the Ontario Co-operative Dairy Products, Limited. This measure laid down the general principles. It was provided that the cheese factory and creamery should be the unit of organization. Stock should be subscribed by the factory as a corporate body in accordance with the output, and then the factories should be grouped in areas of fifteen or twenty to elect a director. These directors in turn would elect a small executive, and in this way the company would have the advantages of a strong executive administration and also retain a democratic touch with the producers who in the last analysis would have control of the policy. Each factory would continue in its present ownership but would sign an agreement to market its output solely through this company for a period of three years. Fifty per cent of the cheese factories and twenty per cent of the creameries are expected to sign up on this basis before the company would be justified in going ahead and doing business. The output would be graded and pooled according to grade. Producers were to receive about 80 per cent of the prevailing market prices soon after delivery and the balance later, after deducting the expenses of marketing. It is proposed that the company shall secure the services of the best men available for management, and market the output on primary or export markets as circum-

stances seem to indicate to be best. It is urged that this form of organization will eliminate all elements of speculation and return to the producers the maximum amount of the prevailing market price.

In the educational work necessary to bring this to the attention of the thousands of dairy producers in the province, a systematic campaign is being carried on by the provincial directors of the company, of which John Beatty, of Mallorytown, is president, and E. H. Stonehouse, secretary. Local committees have been formed in most of the cheese producing counties as the company is concentrating on this branch of the industry. Meetings have been addressed by many leading dairymen, and also by the Minister of Agriculture for Ontario, and Mr. Aaron Sapiro, of California, who has established himself as perhaps the most outstanding exponent of co-operative marketing on a commodity basis on this continent. These meetings have all been well attended and have attracted a great deal of interest. Local meetings are now being held, and the subject will come up for definite action at the annual meetings of the various cheese factories. As this new organization would to some extent displace the old cheese board system, which has been in operation for a great many years, there is naturally considerable opposition from this quarter. As there are upwards of one thousand cheese factories and creameries, it is obvious that there is a very large field to cover to get the matter before each factory meeting fully and clearly so as to permit an intelligent decision. This is a large contract which may not be fully accomplished in one season. The subject, however, has created a great deal of interest, and it is recognized that the principle is sound and one which must ultimately prevail

A SYSTEM OF PEDIGREEING POULTRY

BY MORLEY A. JULL, Ph.D., Macdonald College, Que.

THE fundamental object of the poultry breeder is to control and direct the process of reproduction in such a way that the product may have the highest possible value. The more complete is the control and the more definitely the process is directed towards the desired end, the greater is the success of the breeder. Since the poultry breeding industry rests upon a foundation of pure-bred pedigreed stock, it is very necessary to have a simple though complete system for keeping the pedigree records which permits of skilful, well-planned and carefully executed breeding.

The greatest progress in breeding for increased egg production can only be secured through the adoption of a definite objective at the commencement of breeding operations. Such an objective should include a proper appreciation of the importance of constitutional vigor in the breeding stock, the degree to which the individual breeders conform to the type and colour standards of the breed and variety respectively, the size of the breeders used in relation to the standard weight of the breed, the amount of broodiness, the number, size and colour of eggs laid by the hens used as breeders, the fertility and hatchability of the eggs and the vitality of the chicks of any particular mating. Beyond all this, it may be said that the only certain and sure test of the worth of an animal as a breeder is found in the actual performance of that animal's progeny. It is highly important, therefore, that due consideration should be given by breeders to the value of the progeny test, for progeny testing serves as the foundation

for the greatest improvement in breeding.

The fundamental feature of a system of pedigree records is that any given pedigree or part of a pedigree may be entered or consulted after entry with the least possible expenditure of time and labour and the greatest possible accuracy. The system should be adapted to reducing the possibility of error to the minimum and it should be simple enough to be operated rapidly. For the past few years the Poultry Husbandry Department at Macdonald College has been using a system that has proven quite satisfactory and a brief outline of the method followed in pedigreeing poultry bred for egg production is presented here.

The first step in carrying out a scheme of progeny testing is to record on each egg the number of the hen that laid the egg. To be able to do this, trap-nesting is necessary, and, of course, the hens must have numbered leg-bands, preferably sealed bands. Since the object in view is the development of a heavy laying strain, naturally a record should be kept of the annual production of each hen, and Fig. 1 shows a suitable form on which the annual production may be recorded. Among other things the amount of broodiness should also be recorded on this form. The size of the form is 5 inches by 8 inches with a margin at the left for fitting in a patent loose-leaf binder.

Having recorded the numbers on the eggs laid by the individual hens in the breeding pen, it is next necessary to hold the eggs until they are to be incubated. The eggs should be incubated as soon as possible after being laid, but much time will be saved if four or five eggs from each hen are incubated together. Eggs should not be held over one week, during which time it is well to turn them occasionally. An egg-table with little strips running across the top facilitates the sorting of the eggs laid by the different hens. Each hen's eggs are grouped together, and as the incubator is filled, the entries are made on the "Incubator and Brooder Record" shown in Fig. 2. Both sides of this form may be used so that one form will do for each hen for about fifteen weeks, which is longer than the normal hatching season. The form is 8½ inches by 9 inches, and each sheet is numbered.

On the eighteenth day of incubation the eggs remaining in the incubator are all placed on the sorting table and each hen's eggs are grouped together for placing in the hatching bag or basket. Suitable hatching bags for holding five or six eggs may be made of strong cheese cloth or scrim, or a wire basket with a securely fitted top may be used. It is very important that every precaution be taken to keep each hen's eggs and the chicks hatching from them separate from the others. The hatching bag or basket should be carefully numbered.

After the chicks are hatched it is necessary to give each chick a numbered leg-band or, better still, a numbered wing band. The bands should be numbered serially from one up to the number desired. If leg-bands are used they will have to be changed from the legs and inserted in the wings when the chicks are three or four weeks old or the chick leg-bands can be changed for sealed wing-bands. The advantages in wing-banding the chicks at hatching time are that it is at once permanent and the danger is avoided of causing lameness before the leg-bands are enlarged or removed. For very valuable chicks a band may be inserted in each wing.

The chick band-numbers are recorded on the "Incubator and Brooder Record," and they are also recorded serially on the index form shown in Fig. 3. The purpose of the index form is that deaths and losses may be readily recorded by reference to the page shown on the preceding form. The "Hatching Record," shown in Fig. 4, gives the collected information obtained from the "Incubator and Brooder Record" on the fertility and hatchability of the eggs and the

Macdonald College—Poultry Department—Egg Records.

House No	Hatched	Chick Band No	Bird No.
Pen No	Variety	Breeder No Original No	Out of Mating

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTALS
NOV																																
DEC																																
JAN																																
FEB																																
MAR																																
APR																																
MAY																																
JUNE																																
JULY																																
AUG																																
SEPT																																
OCT																																

Mating out of which game	Mating No	Band No	Breeding History Year	Notes
Mother			Matings	
Mother's Mother				
Mother's Father			Pen No	
Father				
Father's Mother			Breeding Index	
Father's Father			Body Weight	

B Broody O—Over Broodiness X—Broken Egg
N On Nest F Egg Eaten

Fig. 1. ANNUAL EGG RECORD FORM, in facsimile, reduced

HEN No. **INCUBATOR AND BROODER RECORD.** 108

Date Set
Incub No
Eggs Set
Infertile
Blood Rings
Dead Germs
Died in Shell
Hatched
Date Hatched
Brooder No.

Chick No.	Died	Chick No.

Fig. 2. In facsimilie reduced.

INCUBATOR AND BROODER RECORD INDEX

Chick No	Page	Chick No	Page	Chick No	Page	Chick No	Page	Chick No	Page	Chick No	Page	Chick No	Pa

Fig. 3 In facsimilie, reduced

Egg Color
Egg Length
Egg Breadth
Egg Weight
Egg Index
Bird No
Mating No

Hatching Record

Date Hatched	Eggs Set	Infertile	Died in Shell	Hatched	Died in 4 Weeks	Incubator	Brooder
Total							
Per Cent							

NOTE—Per cents died in shell and hatched estimated on No. fertile eggs. Per cent died in 4 Weeks on No. hatched.

Fig 4 In facsimilie reduced.

number of living chicks up to four weeks of age. The size of the index form is the same as that shown in Fig. 2, while the size of the form shown in Fig. 3 is the same as that shown in Fig. 1.

The four record forms mentioned previously provide for the recording of complete information concerning the annual production of a hen and the incubation results of her eggs set and the number of chicks alive up to four weeks of age. On the first of October of each year or earlier the entire stock of pedigreed chickens is gone over and the progeny of each hen is leg-banded, the leg-band numbers being recorded opposite the wing-band numbers as shown in the "Rebanding Record," Fig. 5. In the case of valuable birds it is well to put a leg-band on each leg, and in males it is advisable to have the bands placed above the spurs.

Another form, not shown here, is used in recording the pedigrees of all birds based on their wing-band numbers. This form provides for the entry, on the extreme left-hand side, of the wing-band numbers in serial order. Then follows the numbers of the dam and sire for each wing-band entry and the pen in which the bird with the wing band is placed. This form enables one to trace the breeding of any bird that may be picked up anywhere on the plant. Later in the year the same form is used for the matured pullets and cockerels except that the leg-band numbers are entered in serial order. Then the wing-band is placed next, followed by the dam's number, the sire's number and the pen. This double record of wing-band and adult leg-band numbers entered serially serves as a double check in tracing the pedigree of any bird at any time. Rarely does a bird lose both wing and leg-band, but in the case of very valuable birds it is a wise precaution to put a wing-band in each wing and a leg-band on each leg.

The complete results for each hen are recorded on what is called the

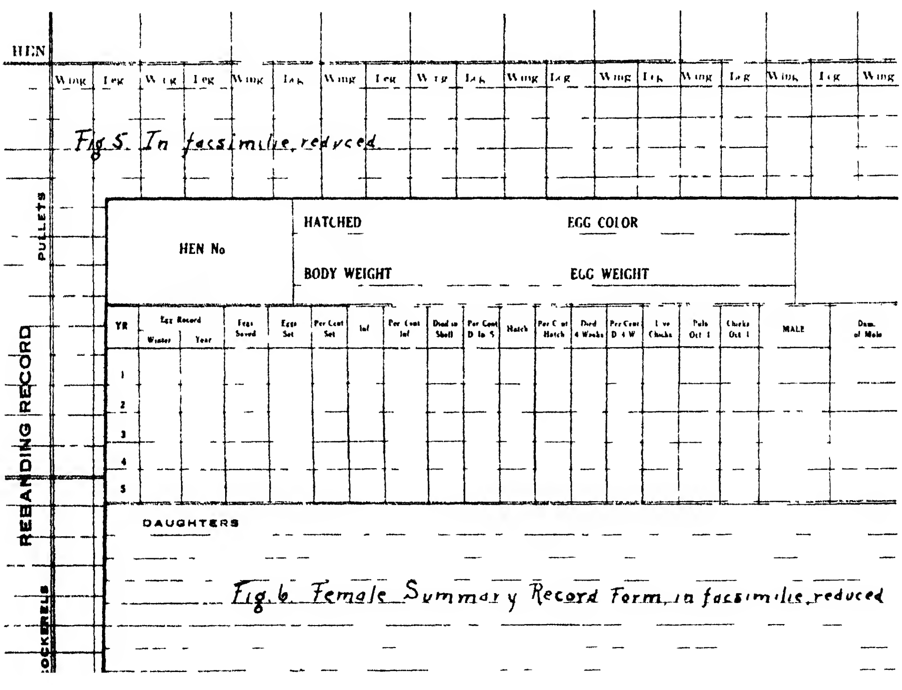


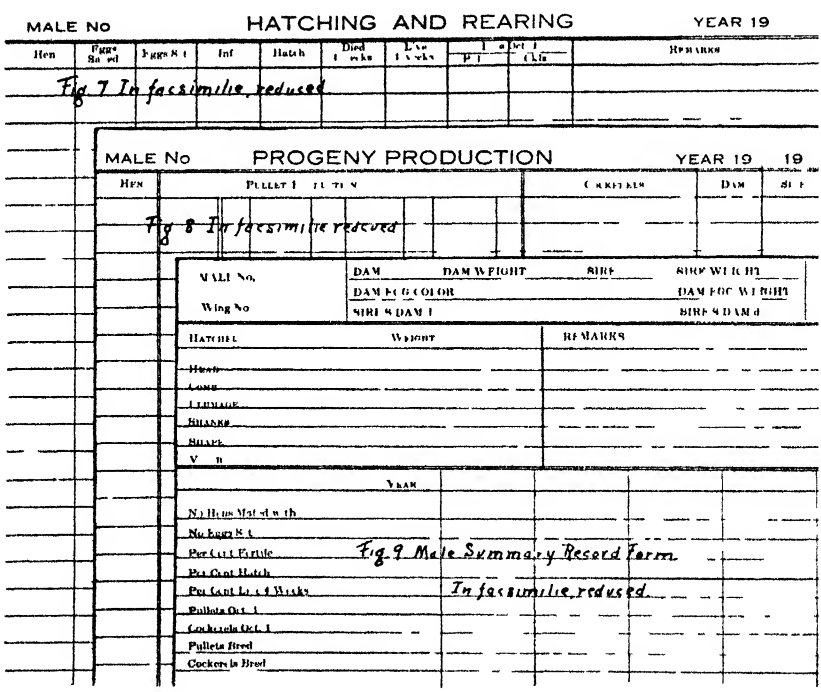
Fig. 5. In facsimile, reduced.

Fig. 6. Female Summary Record Form, in facsimile, reduced.

"Female Summary Record" shown in Fig. 6. This form is of the same size as that shown in Fig. 1. In addition to the information already indicated, this form gives the date the hen herself was hatched, her body weight, her egg weight and egg colour as well as the winter and annual egg production Provision is also made for recording the mating for each year the hen is bred Also, a list of daughters with their production is recorded On the reverse side of the form a blank chart provides for recording the pedigree to the fifth generation.

with others, valuable information may be gained regarding a particular male bird.

After the pullets are all banded, those from each hen are grouped to follow the number of the hen in the "Progeny Production" form, shown in Fig. 8, the same size as Fig 2. The production of the pullets is entered after their numbers and this card thus constitutes one of the most valuable features of the entire record system There is shown at a glance not only the best matings, but also, the breeding performance of one male as compared with the others


MALE NO HATCHING AND REARING YEAR 19

Hen | Eggs Saved | Eggs Set | Inf | Hatch | Died 4 wks | Live 4 wks | 1 Oct 1 P T | Ckls | Remarks

Fig 7 In facsimile, reduced

MALE No PROGENY PRODUCTION YEAR 19 19

Hen | Pullet Production | Cockerels | Dam | Sire

Fig 8 In facsimile reduced

Male No. | Dam | Dam Weight | Sire | Sire Weight

Wing No | Dam Egg Color | Dam Egg Weight

Sire's Dam | Sire's Dam

Hatched | Weight | Remarks

Head
Comb
Plumage
Shanks
Shape
V

Year

No Hens Mated with
No. Eggs Set
Per Cent Fertile
Per Cent Hatch
Per Cent Live 4 Weeks
Pullets Oct 1
Cockerels Oct. 1
Pullets Bred
Cockerels Bred

Fig. 9 Male Summary Record Form.

In facsimile, reduced.

What has been done for the female should also be done for the male, if a true estimate is to be gained of his breeding worth. The male in the original breeding pen is, of course, numbered The information obtained for each hen from the "Hatching Record," Fig. 4 is transposed to the "Hatching and Rearing" form shown in Fig. 7, which is the same size as that shown in Fig. 2. By comparing the results of one male

is brought out quite clearly. On this form, also, the number of the cockerels obtained from each mating are recorded and the mating is recorded that produced each hen to which the male was mated.

Finally, complete information concerning the male is recorded in the "Summary Male Record," shown in Fig. 9. The size is the same as for Fig. 1. This form contains a fairly com-

plete description of the male together with the results obtained for each breeding season so long as he is used. On the reverse side of the form a blank chart provides for recording the pedigree to the fifth generation, and the photograph of the bird may be attached.

In conclusion, it may be said that the system of pedigreeing poultry outlined above provides for a progressive entry of all records, one stage leading logically to a succeeding stage. The system is a simple one though it provides for the entry of all desired information, and with a reasonable amount of care the possibility of error is reduced to the minimum. The significance of the progeny test is made clear, the progeny-production entries being one of the chief features of the system. All in all, the system provides the breeder with a means of directing and controlling his breeding operations without which the greatest progress could hardly be achieved.

SOME ASPECTS OF THE MANITOBA DAIRY INDUSTRY

BY L A GIBSON. Dairy Commissioner

DAIRYING is one of the oldest and most important industries in Manitoba, and dates back to the very earliest settlement. A small herd of cows was brought to the Red River Settlement by the Selkirk Settlers in 1813, and in 1823 a herd of 300 cattle was driven up from the United States and disposed of to the Red River colonists. In those early days the settlers kept cows largely to supply the needs of their own families in milk, butter and cheese.

Since the early eighties dairying in Manitoba has been a child of many adversities. Manitoba was advertised as a great grain growing province, and was famed for its "No. 1 Hard Wheat," with every justification. When the season was favourable for grain growing the production of dairy products decreased. and vice versa. A very large percentage of the settlers coming into the province in the early years not only had no intention of engaging in dairying, but many expressed a decided aversion to it. We stood at the parting of the ways for a long time, and it is only during recent years that we have turned the corner in dairying. Now, a considerable percentage of our most progressive farmers are proud to be classed as dairymen, realizing that dairying and live stock industries are essential to a permanent system of agriculture.

Seven years ago large quantities o creamery butter were being shipped into Manitoba. To-day that condition is altogether changed. This year (1922), we will ship out of the province a million dollars worth of creamery butter, besides taking care of our own market requirements. The total value of dairy products produced in Manitoba during 1922 will amount to twelve million dollars, not taking into consideration the value of skim milk used on the farms for feeding live stock, which would be worth at least another two million dollars.

Winnipeg's Milk Supply

In regard to the source of milk supply for the city of Winnipeg a gradual change is taking place. Ten years ago most of the milk used for domestic consumption was produced within a radius of twelve miles from the centre of the city, on small farms of from one to five acres. These dairies are being gradually eliminated, the owners moving farther out to where land is cheaper; where

they can grow practically all their own feed; and where they can have more and better pasture. They are now producing milk under more natural conditions. This gives permanency to the business of milk production for the city trade.

With a yearly decrease in the number of small dairymen close to the city who deliver for domestic consumption, the large city milk distributing companies require to reach out farther in the country for supplies to meet the increasing demand, and the most logical point to obtain their supply is in the better developed dairy districts, where cheese factories and creameries have been in operation for a number of years. Consequently, during the last five years several cheese factories have been closed and their places taken by milk receiving stations, which provide a more remunerative outlet. The milk is received at these stations from the farms, weighed tested for fat and solids, and the sediment test for cleanliness applied. It is then placed in cooling tanks with ice and water and shipped to the city daily. Eight of these stations are in yearly operation in districts which previously made cheese; consequently the make of cheese in the province has shown a decline during the past few years.

A number of creameries within a radius of 150 miles of Winnipeg are also used for shipping milk and sweet cream during the winter months. We have several points, situated 30 to 50 miles from Winnipeg, which have been developed during the past few years, that now ship daily to the city from 25 to 200 eight gallon cans of milk or an average of from one to eight tons daily.

Character and Trend

We have approximately 25,000 farmers in the province engaged more or less in dairying. From 900 to 1,000 ship milk to Winnipeg during the winter months, and about 600 during the season of heavy production. About 1,500 ship sweet cream to the city for domestic consumption, and the remainder market their surplus product in the shape of cream for butter making to one or more of the 47 creameries situated throughout the province.

For some years to come the general trend of dairying in Manitoba will be more towards the creamery side of the business than to that of cheese making, on account of the large farms and the sparsely settled districts. As the country becomes more settled, with smaller farms and larger herds, which are essential features in the successful operation of cheeseries, this end of the business will develop.

The yearly increase in the number of silos denotes the growing interest in live stock and dairying. This is an encouraging feature, as it means more economical production of milk and cream. Corn and sunflowers are the principal crops used for silage in the province. We have not sufficient experimental data available to determine exactly if the sunflower silage is as good as corn. However, very satisfactory results have been obtained so far from the feeding of sunflower silage, and it looks at present as if it would become a very popular crop for silage, yields of over 30 tons to the acre having been secured. The advancement of the silo has been a prominent feature of all educational work carried on.

The grain crop in Manitoba has been the big money producer for years, and will continue to be for some considerable time; but the general trend has been for dairying to increase more and more each year. It is simply a choice between grain growing, where the farmer does all the work in a few months each year, and diversified farming, where the live stock does the most important part of the work. It is a choice between investing the whole of the labour, seed, and time in one crop, which is uncertain, and engaging in a business that is less speculative and more evenly distributed throughout the year.

The good dairy cow has always been a splendid market for farm products,

and we do not believe there is any danger of getting too many good dairy cows on our farms. The losses are produced by the unprofitable dairy cow, and to avoid loss she should be eliminated.

With the advance of dairying from a neglected side line to one of the most important sources of revenue, more attention is paid to keeping better stock. This in turn creates interest in better management, and cow testing work takes its proper place in general farm operations. Although there are only a few specializing in dairy farming, the number of cows whose record of production are kept is gradually increasing. Some of these records are kept privately, but in the majority of cases the farmer takes advantage of the cow-testing work carried on by the Department of Agriculture.

Efficiency is the watchword in all lines of successful business to-day. Efficiency in the dairy business means the production and distribution of milk and its products as cheaply as possible, and in such a manner as to command the highest market price. The problem of production is mainly an individual problem with each dairyman. The problem of marketing is one that can only be solved by all dairymen pulling together and producing the very finest article possible. This requires our most careful consideratioin.

In order to take stock of the situation intelligently, we must look at it from an international standpoint. If we confine our observations to Manitoba or Canada alone we are dealing with only one factor among the many that affect the situation. The trade in dairy products is international, and as far as prices are concerned is determined by the law of supply and demand. It is a supply operating on a world basis. The Canadian surplus of dairy products is important only as it adds to the world's total supply. The fact of so many countries producing, with opposite seasons of flush production and varying climatic conditions, tends to stablize market prices the year around.

Recent Developments in the World's Butter Trade

Outstanding among the changes that have taken place since the beginning of the war are the decline and recovery of the British butter trade, the shift in sources of supply from European to South American and Australian countries, and the changed economic status of Russia and Germany.

The United Kingdom at present constitutes the world's principal market for butter. Therefore the situation in that country may be taken as a fairly clear reflection of the dairy industry the world over. The total imports of butter by the United Kingdom during 1921 amounted to 394,688,000 pounds, which was slightly more than double the imports of 1920. The increase in imports over 1920 from the more important sources of supply was phenomenal. New Zealand, for example, furnished 79,000,000 pounds, an increase of 158 per cent over 1920; Argentina furnished 45,000,000 pounds, or three times the amount furnished in 1920; and the imports from Australia during 1921 amounted to 104,000,000 pounds, which was four times the quantity of 1920.

The rapidity and extent to which the United Kingdom is regaining her prewar status as an importer of butter is evidenced by the fact that the 1921 imports were 85 per cent of the 1909-13 average of 467,000,000 pounds, while those for 1920 were 41 per cent, and for 1919 only 37 per cent. The most important factor in the increase in imports during the past three years is the increase in the amounts now being supplied by Australia, New Zealand, and Argentina, as outlined above.

During 1921 Australia, New Zealand, and Argentina provided one-half of the United Kingdom's imported supply, while before the war less than one-fourth of the total came from these sources. The imports from Denmark have also

increased during these three years, but not in as great a proportion, that country having furnished 140,019,000 pounds during 1921, compared with 190,895,000 before the war. The above figures give some idea of the development of the dairying industry in Australia, New Zealand, and Argentina, and further show the competition which we meet on the world's principal butter market. During the last few years Australia and New Zealand have been producing an exceptionally fine grade of butter, which is commanding favour on the British market. The quality has been built up largely through their grading service, which is unmistakable evidence of the need and wisdom of establishing a Federal Grading Service for all Canadian dairy products exported.

THE SASKATCHEWAN COLLEGE OF AGRICULTURE

BY W. J. RUTHERFORD, Dean of Agriculture, University of Saskatchewan

THE College of Agriculture for Saskatchewan is an integral part of the provincial university, which was established in 1909 under the Saskatchewan University Act, passed in 1907. The various departments of instruction, research and extension, such as English, Mathematics, Language, Economics, Chemistry, Biology, Law, Field Husbandry, Animal Husbandry, Civil Engineering, Veterinary Science, Home Economics, History, etc., are all departments of the university. Each faculty or college has its own group of departments, indicating its particular field of work, and such other departments as minister to its students or as may be assigned to it from time to time. This type of organization was arrived at through an effort to effect economy and efficiency in administration and in staff, buildings and equipment.

The College of Agriculture is built up around a core of technical departments, viz., Soils, Field Husbandry, Horticulture, Animal Husbandry, Poultry, Dairying, Veterinary Science, Farm Mechanics, and Farm Management. In addition to these, the departments of Biology, Chemistry, Physics, English, Economics, and Extension have representations on the faculty, who have full privileges of discussion and voting. It has a number of buildings planned and equipped for carrying on its particular work. Its laboratories and equipment are, under certain limitations and restrictions, available to students in other colleges of the university. Students in Agriculture enjoy all the advantages—laboratory, library, social, dormitory life, public speaking and debates, athletics—that are incidental to a university. The atmosphere of the university stimulates students to study and research, and the staff and equipment induce them to participate in investigation work that will lead to a broader knowledge of the science of agriculture. Students who take one or more year's work at the college should be able to conduct more profitably their farming enterprises, and be better able to adapt themselves to new and changing conditions than if they had not had such advantages.

The work at the college is laid out along three lines—research, instruction, and extension. It is the duty of the college to utilize all its powers for the purpose of extending the boundaries of knowledge of scientific and practical agriculture. During the last fifty years, the sciences of Chemistry, Biology, Bacteriology, and Physics, in their application to agriculture, have made great advances. But much remains to be done. Soil diseases, crop diseases, and

animal diseases call for investigation and remedies. Systems of farm management such as will result in maximum profits and at the same time conserve our soil fertility, must be worked out in a scientific and practical manner. The development of rural Saskatchewan calls for scientific treatment.

Students who come to the college for longer or shorter periods receive instruction in the courses as laid down to meet their respective needs. The college aims to give its students a broad training in the fundamental sciences, in English, Economics and History, and in the purely agricultural subjects, Field Husbandry, Animal Husbandry, Dairying, Poultry, Agricultural Engineering, Horticulture, and Farm Management, with a view to fitting them not only for farming, but for leadership and good citizenship.

For those who live on the farms near to or remote from the university, and who cannot avail themselves of the opportunities afforded for resident study, the college has an Extension Service which is described in the accompanying article.

The college has over 1,400 acres of land at the university, which it uses for the purposes of investigation, demonstration, and for general farming and live stock maintenance purposes. One quarter section (160 acres) has been recently purchased to be used for the production of pure seed which will be distributed to the farmers through the agricultural societies. The college has also a hay farm comprising 560 acres, located about 35 miles distant, near Dundurn. This farm was bequeathed to the college by the late J. R. Proctor, a pioneer farmer of the district.

Good representatives of the market classes of the various kinds of live stock, as well as herds, flocks and studs of pure-bred breeding animals, are maintained for class work, investigation and demonstration. Animals selected from the college stables have been successful in winning firsts and championships at the leading live stock exhibitions among which are Saskatoon, Regina, Brandon, Guelph, and Chicago.

Two courses of instruction are offered at the College of Agriculture. The course leading to the degree of Bachelor of Science in Agriculture covers a period of four years. It is intended for young men who wish to prepare themselves for teaching in secondary schools or colleges, research or administrative work. Students wishing to specialize may do so in their third and fourth years in either Field Husbandry, Animal Husbandry, Poultry, Dairying, or Agricultural Engineering.

The course leading to the Certificate of Associate in Agriculture covers a period of three years. It is intended for young men who purpose making farming their life work. It offers a good training in the more practical subjects such as Field Husbandry, Animal Husbandry and Poultry, Agricultural Engineering, Horticulture and Forestry, Dairying, English, History, Economics, Arithmetic and Accounts. In addition to these, the student is given an insight into the basal sciences—Chemistry, Physics, Biology, and Bacteriology—sufficient to give him an appreciation of the relation of these sciences to agricultural processes and practice.

A student to be admitted to the Associate course must be sixteen years of age, physically strong, of good morals, sufficiently acquainted with the English language, and sufficiently educated to enable him to profit by the instruction, and must have had one year's experience, from seeding to harvest, on a farm. It is not necessary to pass an examination in order to be admitted to this course.

A candidate for the Degree course must fulfil all the requirements for admission to the Associate course, and in addition must pass a matriculation examination similar to that demanded by the other colleges of the university.

A Bachelor of Science in Agriculture who has obtained a sufficiently high

standing in his course may, with the permission of the faculty, proceed to the Master's degree in Agriculture.

The Degree course opens the last week in September and lasts for seven months. The Associate course opens on the Tuesday nearest the first of November and closes before the first of April, in time to allow the students to reach home and make preparations for the spring seeding.

THE SASKATCHEWAN AGRICULTURAL SOCIETY AS AN EXTENSION MEDIUM

BY JOHN J. RAYNER, Director, Extension Department, College of Agriculture, University of Saskatchewan

THE very important place held in Saskatchewan by the Agricultural Society will be the more readily appreciated when its relationship to Saskatchewan's College of Agriculture is understood. Briefly stated, the college performs a three-fold function: research, intra-mural teaching, and extension. The Extension Department is charged with the duty of taking the service offered by the college to those who cannot come to the college to take intra-mural training. This is a big task, for it must reach as nearly as possible all those living in the province who are dependent on the land for the means of subsistence. Some medium must be used for carrying on this work, and the Agricultural Society and its sister organization, the Homemakers' Club, constitute this medium. These might be termed the official units through which the Extension Department operates, the Agricultural Societies being of service largely to the men and the Homemakers' Clubs to the women. The service of the Extension Department is, however, by no means confined to these organizations, for it freely co-operates with Grain Growers' Associations, community clubs and any other recognized agricultural organizations. But the Agricultural Society, by reason of the purpose for which it was organized and because it receives grants of public moneys, is the most effective medium through which the Department of Agriculture and the College of Agriculture can be of service to those getting their living from the land.

The first Agricultural Societies in the territory now known as Saskatchewan were organized in 1884. In 1905, the year the province was created, there were 33 in existence. This number has gradually increased until to-day there are 150 chartered societies. Considering the broad purpose for which they were organized and the large territory they cover, this is remarkable growth. The development in the range of the activities undertaken by the societies has been none the less remarkable. In 1903, the work of the societies was first placed under a director. Up to that time, the conducting of summer fairs and institute meetings was in the main the extent of their work, whereas during the present year there were upwards of twenty separate important enterprises engaged in.

Some estimate of the extent of the work of the societies can be gained from the following figures applying to 1921:—

Total Membership.	22,610
Average Membership.	166
Total Receipts.	$532,830 98
Total Expenditures.	498,772 87
Total Assets.	392,216 26
Total prizes paid for Live Stock and Agricultural and Domestic Products.	198,797 98

During the year ended April 30, 1922, which is the period covered by the last annual report of the work of the socie-

ties, the following enterprises were conducted:—

140 Agricultural Exhibitions;
25 Ploughing Matches;
3 Good Farming Competitions;
37 Standing Crop Competitions,
2 Combined Seed Crop and Cleaned Seed Competitions,
10 Summerfallow Competitions;
7 Farm Garden Competitions;
2 Spring Stock Shows;
8 Live Stock Sales,
29 Seed Fairs;
27 Poultry Shows;
99 Short Courses in Agriculture;
17 Agricultural Society Rallies;
22 Functions held in conjunction with annual meetings;
49 Courses in Stock Judging for boys attending the Farm Boys' Camps

In addition to these features, a great deal of very progressive work which cannot be tabulated was accomplished. The activities listed above, with only very few exceptions, were conducted under the auspices of Agricultural Societies

The combined seed crop and cleaned seed competition, the standing crop competition, and the seed fair are supported by grants from the Federal Department of Agriculture equal to two-thirds of the prize money paid out. Fourteen other contests, most of which are named in the list recorded for 1921, are supported by grants from the Provincial Department of Agriculture equal to one half of the prize money paid out. Certain maximums are stated, however, for all contests except the agricultural fair. The societies may earn fifty per cent of the prizes paid at these for live stock and agricultural and domestic products

It will be noted that of the activities mentioned, the summer fair is, in the aggregate, given the premier place by the societies. Most of them look upon it as the most valuable feature they can include in their programme. This may be true if the educational value of the fair is not interfered with by sporting features. President McKinley once made the following statement: "Fairs and exhibitions are the time-keepers which mark the progress of nations. They record the country's advancement; they stimulate the energy, enterprise and intellect of the people and quicken human genius. They go into the home, they broaden the life of the people and open mighty storehouses of information to the student. A comparison of ideas and products is educational and instructs the hand and brain of man." So long as no effort is spared to make the summer fair accomplish such desirable ends, its popular position is not likely to be seriously challenged. Eternal vigilance and sane leadership are necessary, however, to prevent its corruption by the introduction of an over-balance of sporting features.

The Farm Boys' Camps have reached the point where they constitute perhaps the most effective method evolved of being of service to farm boys. First introduced in 1915 as a feature of the Regina fair with an attendance of 200 boys, the movement has developed until last year successful camps were held at five large centres, and in the eight years a total of approximately 2,500 boys has been reached. The camps have from the first commanded the undivided support of the societies. A full description of this movement will appear in a later issue of *The Agricultural Gazette.*

Special mention should be made of the community movement for the breeding of live stock, introduced by the society situated at Creelman Six thousand dollars was raised and expended in the purchase of nine purebred Berkshire sows and twenty-four Shorthorn heifers, all of excellent breeding. The Berkshire Club enrolled at the beginning eighteen members, and a like number joined the Shorthorn Club. Provision was made for the extension of the plan whereby original members not supplied and new members as well should secure progeny from the breeding stock originally purchased. The plan has worked admirably and its advertisement in various ways has resulted in other societies undertaking similar progressive features. It was conceived by the Creelman Society as a means of preventing the agriculture of

50572—4½

the district from succumbing too disastrously to the depressing conditions following the War, and is a factor not to be disregarded if the establishing of a permanent agriculture is the desired goal.

Other societies have introduced such admirable features as tree-planting campaigns, the distribution of first-class registered seed grain to their members, the building of community halls, etc. Space will not permit a description of these but suffice it to say they give evidence that the societies consider self-help the truest form of community endeavour and do not hold only such enterprises as are supported by government grants.

The Act which governs the societies outlines their objects as follows:—

> "The objects of a society shall be to encourage improvement in agriculture, horticulture, aboriculture, manufactures and the useful arts."

This includes the improvement of agriculture in its broadest sense, embracing all factors entering the business of farming, including the farm home and the community life. The Agricultural Society has been given the guardianship of agriculture in the district it was designed to serve. Its field of service is almost without bounds and limited only by the idealism of its directors and the enthusiasm with which the members lend their support

ALBERTA WOMEN'S INSTITUTE GIRLS' CLUBS

BY JESSIE C McMILLAN Director Women's Extension Service

THE need for some form of girls' clubs in Alberta became evident in 1918 when home nursing instructors working for the Women's Institutes found girls greatly interested in nursing lectures and first aid courses. Some girls suggested that they should organize clubs. This was done, and they appointed supervisors from the Women's Institutes in their own districts. Most of these clubs took for their first practical work the study of home nursing and first aid, books on these subjects being supplied to help them in their work.

In 1919 the Legislative Assembly passed an amendment to *The Alberta Women's Institute Act* creating the Alberta Women's Institute Girls' Clubs, thereby enabling eight girls or more living in any rural community, village, town or city to form a club and to receive the benefits of Government assistance as provided for by the Act.

The formation of such clubs has been the means of bringing together girls with widely divergent interests for purposes of education and community work as well as in a social way Many girls after they have left school feel that they wish to continue their studies. Where a few can band themselves together, greater interest is stimulated, and the girls have the benefit of good moral support and encouragement, as their supervisor is a member of the district Women's Institute.

The Girls' Clubs have justified their existence and have become thoroughly established. There are now sixty-four such clubs in the Province with a membership of 1,050.

The provincial executive consists of a president, vice-president, secretary-treasurer and four directors, one for each district in the Province.

Since their formation in 1919, the clubs have met annually in convention for two days at the close of the Alberta Women's Institute Convention. This convention is full of interest, and if any one has doubts as to the need for these clubs, it would be well for them to attend such a meeting. One of the

Women's Institute directors remarked on the splendid order and method with which the girls conducted their convention. The business consisted of secretary's report and reports of the branch clubs followed by discussions, and these took up the greater part of the time. On the afternoon of the first day they had an excellent demonstration on physical culture for girls. It illustrated the benefits of acquiring attractiveness through the development of a healthy body rather than by the use of paint, powder and other artificial media. They also had two interesting addresses from prominent social workers in the Province.

In connection with the Women's Extension branch of the Department of Agriculture, the writer made a short statement at the convention, and asked the clubs to consider the question of how this service could best help them and, through their local organization, the girls of the Province. The result was the issuing of the following statement by the secretary:—

"The officers of the Women's Extension Service of the Department of Agriculture, at the third annual convention of the Women's Institute Girls' Clubs, desire to help the Girls' Clubs along any line of work in which they are interested, and which would be of practical help to themselves individually, and also to the girls of their district from the community point of view.

"They would like to know, first, in what kind of work your club is interested and in what line of work you would wish to engage, such as the following:—

(1) Domestic pursuits, as sewing, cooking, home economics, and art as applied to the home and personal appearance;

(2) Training along healthy lines, as first aid, home nursing, physical training;

(3) Bead work and basketry;

(4) Illustrated lectures relating to citizenship, history, geography, etc.;

(5) Fine arts, as the study of pictures, literature, decorative art, music.

"When you have chosen your line of work, the Department would like to know the length of time you deem necessary to deal with your particular subject; whether you wish to deal only generally with the subject or go into it in detail.

"It will be necessary to state at what time of year you could best undertake the work. Kindly impress upon your members that this matter must be given careful consideration and must receive thorough discussion. The Department wishes to do its best for you and the best can only be obtained through our co-operation in this matter.

"The Department cannot promise anything definitely, but all possible effort will be made to satisfy the wishes of the members of the clubs."

Some replies have come to this letter and, so far, they indicate that the girls are greatly interested both in the practical and artistic side of domestic pursuits.

The reference and library departments are also at the service of the clubs. In connection with the preparation of papers for their club meetings, material on a great variety of subjects is asked for, the scope of the requirements ranging from costumes for Christmas carnivals and the origin of St. Valentine's Day to efficient kitchen and labour-saving devices.

Enough has been said to direct attention to the future possibilities of the work that can be done by and through these clubs, if their work and play is developed on good lines and supported by technical instruction, which should be available especially in communities situated in the small towns and rural districts

BOYS' AND GIRLS' DAIRY CATTLE JUDGING COMPETITION

FOR the sixth successive year a Boys' and Girls' Dairy Cattle Judging Competition will be held in connection with the 1923 Convention of the Saskatchewan Dairy Association to be held at Saskatoon, February 7, 8 and 9. The competition is open to boys and girls under 18 years of age from any district in Saskatchewan, mixed teams of boys and girls being eligible to compete. The following prizes will be awarded for the highest aggregate team scores:—First, Silver Shield and $36 cash; second, $33; third, $30; fourth, $20; fifth, $15.

The silver shield was donated in 1918 by Hon. W. R. Motherwell, Minister of Agriculture. The names of the respective winners appear thereon.

Teams will be required to place two classes of dairy cattle and to give brief reasons in writing for their placing, one will be a class of mature cows and the other a class of dairy heifers. The work of each competitor will be scored, the awards being made on the basis of this scoring. There must be three members in each team and only members of teams will be eligible for individual score prizes. There is no entry fee. While the age limit is 18 years, for the past three years the winner of the highest individual score has been under 15 years of age. The 1923 competition will be held in the University Livestock Pavilion, Saskatoon. Special entertainment features outside the competition are provided for the contestants.

HON. NEIL CAMERON, MINISTER OF AGRICULTURE FOR MANITOBA

THE Honourable Neil Cameron, recently appointed Minister of Agriculture and Immigration in the Government of Manitoba, is a native of Grey County, Ontario, having been born in Holland township, September 1, 1864.

When ten years of age he moved to Manitoba with his parents, reaching Winnipeg over the old Dawson trail, which was a very crude highway 499 miles long extending from Thunder Bay on Lake Superior to Winnipeg.

There were at that time, but very few settlers in Manitoba, this being one year ahead of the advent of the Mennonites, who were the first foreign settlers to reach the province, two years ahead of the first contingent of Icelandic settlers, and more than four years ahead of the first railroad train to be run into Winnipeg.

The Cameron family followed the old Edmonton trail westward from Winnipeg about 145 miles, and settled at Basswood, which is a few miles west of the present town of Minnedosa, Man. Hon. Mr. Cameron still lives in the same district, where he owns two thousand acres of land, one farm of six hundred and forty acres of which he operates.

In 1899, Mr. Cameron was married to Miss Mary Kippen, of Stratford, Ont., and his family consists of one son and six daughters.

He was first elected to the Legislature in 1922, but he has had long experience with muncipal affairs.

FINAL REPORT ON GRASSHOPPER CAMPAIGN, SASKATCHEWAN

THE final report on the grasshopper campaign for 1922, in the province of Saskatchewan, has been received from rural municipal secretaries. One hundred and thirty-seven municipalities purchased supplies and co-operated in the fight against the pest. This is five more than in 1921. That year the estimated loss was ninety-three thousand acres, while this year shows a loss of twenty-three thousand acres, a marked and satisfactory decline. The saving this year was approximately six hundred and forty thousand acres.

Weather conditions, growth of the crop and the work of parasites have lent their aid in varying degrees in different localities in different years. This year the growth of the grain was considerably above the average in most of the infested regions, with the result that the hoppers did not make as much headway in their parade of devastation. This also gave a better opportunity for the farmers and local officials to poison effectively.

The following supplies were used:—

2,668 tons 2 cwt bran;
1,671 " sawdust,
519.496 lbs. molasses;
438,315 " arsenic,
242,760 " salt;
809¼ gallons amyl acetate

This means that 8,708 tons of bait were spread, at a total cost of $150.112.49.

The "silver lining to the cloud" is the fact that the southeast part of the province, where the hoppers first appeared in 1918, had little trouble in 1922, and most of their stores of poison were transferred in June and July to western sections where it was badly needed. It is hoped that 1923 will show further areas past the peak of the fight.

PART III

Agricultural Education and Related Activities

FEDERAL ASSISTANCE TO AGRICULTURAL INSTRUCTION IN ONTARIO SCHOOLS

A Review of Developments Since Dominion Aid was First Given

BY Dr. J. B. DANDENO

DURING the passing decade the Department of Education of Ontario carried on agricultural instruction in the public and high schools and in the Normal schools with financial assistance in part from the Federal subsidy under the Agricultural Instruction Act as follows:—

As might be expected, during the first two or three years of the decade, only a small amount of money could advantageously be made use of until organization and propaganda had been carried on to enlist the sympathies and co-operation of the people. In a very few years, as the work actually developed, less propaganda was needed, more work was being done and more money required.

The several activities to which financial assistance from the Federal subsidy has been applied are here given:—

High, Public and Separate Schools

(1) Grants to Boards for equipment;
(2) Grants to teachers for special services;
(3) Expenditure for Agricultural Courses for teachers.

To show the application of the money from the Federal subsidy it might be well to give the approximate amounts received from this fund covering the period from 1912 to 1920:—

1912	$ 1,140 00
1913	4,477 79
1914	4,882 66
1915	4,482 00
1916	4,416 49
1917	18,332 50
1918	65,000 00
1919	38,092 19
1920	40,000 00
Total	$180,823 63*

In order to show also the progress made from year to year, a table is given showing the number of public and separate schools qualifying for grants, and also the number in attendance at the Summer Courses in Agriculture for teachers:—

* NOTE.—The allotment to Agricultural Education in Ontario during the nine years 1913-14 to 1921-22 under The Agricultural Instruction Act was $263,000, as follows: 1913-14, $10,000; 1914-15, $13,000; 1915-16, $20,000; 1916-17, $26,000; 1917-18, $30,000; 1918-19, $40,000; 1919-20, $40,000; 1920-21, $44,000; 1921-22, $40,000; total, $263,000.—*Editor.*

Attendance at the Ontario Agricultural College Summer Courses in Agriculture

Year	Elementary				Intermediate					Inspectors	Farm Mechanics	Total
	I		II		I		II		III	I II	—	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	—	—	Total
1911	8	75	1	16								100
1912	16	65	2	23								106
1913	14	64	5	36	23	4						146
1914	8	55	5	27	13	4	14					126
1915	15	39	5	18	17	1	9	1				105
1916	11	99	9	31	15	3	14	1				183
1917	15	138	7	81	9	1	13	2			10	276
1918	6	187	7	119	20	11	9		9	79	9	456
1919	16	155	6	160	9	19	7	21		86	10	489
1920	28	125	10	135	7	25	19			8	10	374
1921	62	167	36	86	24	15	16	8	7		7	428

The number of public and separate schools qualifying for grants each year commencing in 1903 is given in the following table:—

Year	No of Schools	Year	No of Schools	With School Gardens	With Home Gardens
1903	4	1912	101		
1904	7	1913	159		
1905	6	1914	264	208	56
1906	8	1915	407	222	185
1907	2	1916	585	321	261
1908	14	1917	989	466	523
1909	16	1918	1 020	588	432
1910	17	1919	1 408	618	790
1911	33	1920	1 648	702	946
		1921	1 804	690	1 114

A glance at the table giving the amounts received from the Federal subsidy year by year will show that there must have been a very large amount provided from provincial funds. The following taken from the report covering the school year 1919-20 gives an outline of the expenditure for agricultural education.

The Department of Education paid out for agricultural education in 1920 approximately as follows:—

Public and Separate Schools	$ 77,000 00
High and Continuation Schools.	14,131 60
Summer Courses for teachers..	32,752 00
Salaries and other Expenses. ..	4,200 00
Total.	$128,083 60

It will be seen that, in order to carry on as the province is now doing, it will be necessary to supplement the assistance received from the Federal appropriation by an amount from the province of about $120,000 in one year. However, the Federal assistance proved of great value during the earlier years of the decade, but as the Department of Agriculture of Ontario administered the fund for this province, the Department of Education found it difficult to expand in the direction intended as far as it might.

The total amount received by the province of Ontario during the nine years was $2,675,290.54, and of this amount the Department of Education received $180,823.63,* about one-thirteenth.

The expenditure referred to above for agricultural education by the Department of Education was devoted entirely to the promotion of class work, that is, directly for agricultural instruction—not a dollar for buildings of any kind. It was pointed out by the Commissioner (the late Dr. James) that none should

be used for buildings and none has been so used.

It should be stated that the purpose of the Act was a noble and praiseworthy one, and that the results accomplished show a tremendous development in the schools of Ontario during the past nine years.

The tables of figures given show that, although some of the features of agricultural education were going on before 1912, a good beginning had been made. Financial assistance was urgent at that time as the people of the province were somewhat unfamiliar with the aims and scope of the work attempted and assistance from the Legislature was not so easily obtained as it has proved to be later on as the work developed.

It should also be said that the assistance received from the Federal Government under the Agricultural Instruction Act was very opportune and cordially appreciated by the people of the province. This appreciation is especially shown by the fact that the Department of Education is now spending approximately five dollars for every one received from the Federal subsidy in carrying on the very work which seems to have been intended by the Act. No better evidence of appreciation is needed.

AGRICULTURAL INSTRUCTION IN THE PUBLIC SCHOOL — ITS PLACE AND MEANING

This is the second of the series of articles, which began in the previous number, relating to the purpose and aim of agricultural teaching in the Public School. Further contributions to the subject will appear in the next issue.—*Editor.*

J. W. GIBSON, M.A., Director of Elementary Agricultural Education, British Columbia

To many people "agricultural instruction" means just one thing, viz., "teaching how to farm." This altogether narrow and erroneous idea has been the cause of much trouble throughout the country wherever school courses in agriculture have been introduced. The idea that farming is a man's job and as such cannot be taught to young boys and girls in the public schools is the view sometimes expressed by well-meaning and intelligent people, and of course this is quite true, but when one tries to explain that agricultural instruction as carried on in public schools does not seek to make farmers out of school boys so taught, the mists begin to gather and many people—not all of them farmers by any means—begin to wonder what such instruction is for. Why should any time be spent on agricultural instruction for boys other than those who are destined by choice or by circumstances to become farmers, and above all, why should girls be included in such instruction?

Modern education stresses a few rather simple, but fundamental laws. Not the least of these is the law of relationship or "learning by experience" as we frequently hear it expressed. The child's relationship to his environment has always been, and must always remain, as the very basis of his education. In fact the early years of every child's life is largely spent in establishing his relationship to his environment—first physical, and in later life, social and economic. So true is this that the degree of civilization and the intelligence index of any people or race of people might almost be determined by the success with which they have made and maintained these relationships. What have they done with their natural resources—their timber and building ma-

terials, their water-power, their fisheries, their lands and the fertility of their soil as the main source of their food supply? Surely the character of a child's environment has much to do with the trend of his early education, and may also have a determining influence on his later life and occupation. "I hold," says Professor Bailey, in his fine little book, "The State and the Farmer," "that education in terms of environment is the right of every citizen; and in the open country this kind of education is agricultural education whether so-called or not." This "environmental education" has sometimes been termed "nature study," but in all rural districts, and to some extent in all urban districts as well, it marks the beginning of agricultural education, and here the word "education" means more than "instruction."

During the first few years of the child's life at school the adult notion of agriculture, which is mostly economic, is hardly thought of. To the little child dandelions and ox-eye daisies are things of life and beauty working out their own round of life in sun and wind and rain. To him the birds and beasts, whether of the woods and fields or of the farm yard, are creatures of strange adventure or perchance companions in play. At this stage it is the place of the school to develop "the seeing eye and the understanding heart" with reference to all of these wonderful things with which every child in some measure must establish a relationship. This is the nature study stage in environmental education, and although the plants and animals studied may be the same as those with which the farmer works to earn his living, the purpose and point of view is different. This nature study phase of agriculture is of great importance, however, as it helps to establish wholesome interests in what might be termed an agricultural environment. This growing rural interest leads on to a greater appreciation of rural life and occupation based upon sound methods of instruction and reliable information which can only be gained by direct observation and experience. One educational agency or teaching device which has proved of great value from the standpoint of learning by "direct observation and experience" is the school garden and the school-supervised home garden. Here personal responsibility as well as community interest is emphasized. Here the recognition of personal power in developing good and the suppressing of evil is made manifest. Boys and girls learn not only to provide and control the conditions that favour the growth of plants useful and beautiful, but they learn the larger lessons of self-control and responsible action. One need scarcely stop to ask whether Young Canada stands in need of such an agency to-day. No one has stated the case for school gardens better than Inspector Cowley of Toronto in the following words: "While designed to encourage the cultivation of the soil as an ideal life-work, school-gardens are intended to promote above all things else symmetrical education of the individual. They do not aim at education to the exclusion of utility, but they seek education through utility and utility through education. The garden is the means—the pupil is the end. The garden is not an innovation or an excrescence, or an addendum, or a diversion. It is a happy field of expression, an organic part of the school, in which the boys and girls work among growing things and grow themselves in body and mind and spiritual outlook." If the truth were fully known this is probably the stage when real farmers are in the making, for the real farmer is the one who simply adds to the basic interest of his boyhood manly purpose together with added knowledge skilfully applied.

As school boys grow older their interests change. In the senior grades of the public school the spirit of inquiry becomes more marked and more logical. The elements of the science underlying agriculture are seized upon with interest

and can be turned to advantage practically as well as educationally. Also at this stage of school life the spirit of achievement asserts itself. Boys are anxious to accomplish practical things partly for their own satisfaction and in response to a constructive impulse, and partly for the economic advantages that come to them personally. The result is that with suitable leadership boys and girls at this age will undertake school and home projects in the growing of economic crops, the preserving of food stuffs or the raising of live stock. At this age the school fair contest makes a strong appeal and the school club finds ready support partly because of its social significance. This is the stage when nature study becomes more specialized and motivated in the direction of scientific and economic production. This is public school agriculture and in it lies Canada's main hope for future agricultural greatness.

Agricultural instruction in high schools and special vocational schools is a big subject which is deserving of more careful study on the part of educationists as well as agriculturists.

Space will not now permit of any adequate discussion of this rather controversial subject, but after many years of observation and experience it is the belief of the writer that there is no ground for quarrel between the educational and vocational viewpoints in the matter of agricultural instruction in secondary schools. There is, unfortunately, a good deal of misunderstanding as between the advocates of these two viewpoints. Good teaching after all is the main thing.

A C GORHAM, M Sc Agr, Director, Elementary Agricultural Education, New Brunswic

THE many seemingly different reasons ascribed by its exponents for placing agriculture on the curriculum of our Elementary Schools may be found to be simply the working out of these various personalities rather than real differences of purpose. However, a résumé of the work as carried on in the different provinces may serve to reveal a sameness of purpose or to set forth the different aims if such exist.

The growing tendency in recent years to broaden the course of study in the public schools and the emphasis placed by educationists and others upon the importance of the natural method of teaching children has led to the introduction of such subjects as Manual Training, Domestic Science, Nature Study, and Agriculture, etc. These were not introduced without objection. Those opposing the introduction of such subjects objected on the grounds that their effect would be vocational; that the tendency would be to develop carpenters or farmers instead of giving them a broader outlook on life. But the results of the past ten or more years, if a proper conclusion can be arrived at in that short space of time, does not warrant these subjects being classed as vocational. Neither are they pre-vocational. They are simply educational.

Speaking of Agricultural Education in particular, in the broad sense, its aim is to open the child's mind to his natural existence, develop his sense of responsibility and of self-dependence, to train him to respect the resources of the earth, teach him the obligations of citizenship interest him sympathetically in the occupations of men and quicken his relations to human life in general. It has to do with the making of a life, not simply with making a living.

With such aims as noted above much must depend upon the ability of teachers to appreciate the larger object of teaching, that is, of moulding the young lives under their supervision and their ability to relate the school subjects to the actualities of life. The problem of training teachers therefore must engage the attention of those directing agricultural education.

Criticism is sometimes made of the agricultural course because some teachers find it difficult to teach or because some few make failures of it. It would be unjust to condemn the course because of such criticism. Failures in teaching are being made continually with the older and more cognate subjects. It is simply a matter of more and better training for teachers.

The teaching of Nature Study paved the way for the introduction of agricultural instruction into our elementary schools. Its spirit and method still give the vital force to the subject of agriculture. It emphasizes the natural method of teaching and for this reason makes use of the common things and experiences of life to open the child's mind by direct observation to his natural existence. It is a permanent process because it has to do with the vital things of civilization.

The subject of agriculture was wisely introduced in our schools because it is a basic industry and one in which nearly two-thirds of our people are directly interested. Many teachers throughout the province, especially those who have taken special instruction in agriculture, are making use of the various duties and operations connected with farming to vitalize their teaching. It is taught not only in the purely agricultural sections but in the semi-rural and city schools although it is taught in the latter schools with greater difficulty and consequently in a more restricted manner. It is intended that it shall be taught in such a way that there may be established a greater sympathy and understanding between the urban and rural population. Such sympathy and understanding must have a great influence in dissipating any existing prejudices and helping toward the satisfactory solution of our social and economic problems.

Through the financial assistance provided by The Agricultural Instruction Act, a Rural Science School for teachers has been maintained for the past nine years. It is held for one month during the summer vacation when a fairly large number of teachers avail themselves of the opportunity of making an intensive study of the following subjects: Nature Study, Physics of the Farm and Home, Cereal Husbandry and Plant Physiology, Horticulture and School Gardening, Method and Management. This course supplements the training taken at the Normal School and not only aids them in teaching Nature Study and Agriculture in the class room but fits them to carry on school garden work. Two summers are necessary to complete the course. There is a demand on the part of teachers for the broadening of the course by the addition of other subjects

A course of instruction in Nature Study and Agriculture was authorized for the schools of this province by the Board of Education in 1908. This was revised in 1914. The purpose has been to provide teachers with a definite graded plan for regular, continuous work. This outline is in use in all grades from one to eight inclusive. In many cases the more practical form of the teaching of this subject has been carried into the High School. This is a tendency that is increasing. In this course Nature Study is correlated with other subjects of the curriculum, such as arithmetic, spelling, composition, drawing, history, and geography.

The teachers in the different districts have been able to carry out this course with varying degrees of success. Some, seeing its purpose readily, proceed to apply the investigational method in conjunction with the informational. Others feel that a text book for this subject should be provided. However, while it is held by most authorities that it would be a great mistake to introduce a text book, there should be strongly advocated an extension of the time allotted to this subject in the training of teachers. This will no doubt be brought about when the normal course is extended to two years instead of one, which change is being considered. This with the many excellent reference books and bulletins and

the developing of a greater inclination on the part of the teachers to study the environment, will do much to overcome these difficulties.

From the above it is evident that considerable time must elapse before teachers generally can be adequately trained to make a permanent success in the teaching of this subject.

Optional Phases of School Agriculture

The agricultural course as outlined for the elementary schools is obligatory. The optional phases of agricultural instruction consist of school gardens, home plots, poultry projects and school fairs.

It is very gratifying to know how willing teachers have been to take up this work, for largely through their efforts it has grown gradually and to considerable proportions.

The aim in all these exercises is to make them purposeful activities. They shall be problems in which the pupil is personally interested and through which he may be led to inquire, observe, investigate, and experiment for himself in order that a disposition and mental power be developed for acquiring knowledge for himself.

Conditions existing in many districts throughout the province make it impossible to establish school gardens, yet quite a large number have been maintained during the past ten years. The lack of continuity of teachers and the constant changing from place to place are difficulties attending the maintenance of the school garden.

The school garden is being used more and more as a laboratory to aid class room instruction and in many cases much of the garden is given to experimental work. Small grants are paid the district and the duly qualified teacher where a school garden is properly maintained.

The introduction of the home plot and the standard home garden has developed very rapidly throughout the different districts and is one of the most encouraging phases of the optional work. While they are often taken up where gardens exist, in many places they hav supplanted the school garden. Free seed is distributed to schools making application and brief instruction sheets are provided with the packages. Teachers are requested to give lessons connected with these projects, and on the whole we find they have given good satisfaction consistent with the aim of agricultural instruction.

The Poultry Project, it is intended shall be a business proposition, and there has been no disappointment in this connection as it has given results beyond all expectations. Sittings of pure-bred eggs are sent only to clubs of six or more, and each member and his parent signs an agreement to pay for the eggs not later than a specified date.

School Fairs have grown in favour and to such an extent that assistance outside this department has had to be secured in order to successfully organize and manage them. They have been more than a mere spectacular event and the exhibits are improving in quality each year, showing an increased knowledge on the part of the pupils in this selection. The greatest success is attained where the exhibits are the result of systematic work throughout the year. Thus it becomes a genuine educational factor, aiding teachers in the teaching of this course. In the organizing of the fairs, teachers are encouraged to teach practical lessons in civics by having the pupils and others in the district organized into committees. Thus many worth while lessons are taught in co-operation especially where there are united school fairs.

While the agricultural course is taught in every elementary school in the province the optional phases have reached scarcely more than twenty per cent of all the schools. The most urgent need is for more assistance and the means to carry it into effect.

Everything possible under the circumstances is being done to increase the efficiency of teachers in attaining the ideals of agricultural instruction, by instruc-

tion at the Rural Science School, personal assistance by visitation of schools, and by giving advice and information by correspondence and through the Rural Education Monthly.

The value of agricultural instruction like most other instruction cannot be easily estimated, and while the introduction of the optional phases of the work has progressed very favourably and there are many evidences of a greater appreciation of the courses in general, there has scarcely been sufficient time to determine whether or not its purpose has been accomplished. Progress in this connection to be permanent should be gradual and every step in the development carefully considered.

AGRICULTURAL EDUCATION CONFERENCE

IN the latter part of November a conference on Agricultural Education and Extension Work was held in Toronto under the auspices of the Provincial Ontario Agricultural College Alumni Asociation. H. S. Fry, President of the Association, acted as chairman at all the sessions, and discussions on both specialized agricultural education and general education in respect to rural life were opened by prominent officials of the Department of Agriculture and of the Department of Education. Following this introduction there was a lively discussion by O. A. C. men on many points relating to these subjects. At the conclusion of the conference, the concensus of opinion of those present was embodied in the following resolution:

That, whereas, discussion in this conference has clearly brought out the idea that it is a physical and financial impossibility for any agricultural college to supply by resident teaching the necessary training for the great majority of those who expect to make farming their life work;

And, whereas, this training must be supplied by a co-ordination of other agencies;

And, whereas, the consummation of this object involves the joint efforts of several of the departments of government with its consequent difficulties of co ordination without a general guiding policy;

And, whereas, the various discussions at this conference have conclusively shown the problem of agricultural education to be possessed of so many angles and methods of approach, the whole question should be dealt with on the broadest lines rather than that this conference should make concrete recommendations respecting part or parts of this problem;

Be it, therefore, resolved: That this conference is of the unanimous opinion, and would strongly urge upon the Prime Minister of Ontario and his colleagues that the interests of all people of this province would be best served at this time by the appointment of a royal commission for close study of the educational system with special reference to the education of those living in rural districts and with instructions to report as to the best educational means and agencies and the co-ordination thereof

Carried unanimously.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

CANADIAN HORTICULTURAL COUNCIL PLANT REGISTRATION BUREAU

THE Plant Registration Committee, appointed early in 1922, presented its report at a meeting of the Directors of the Canadian Horticultural Council held at Ottawa on November 13. The committee comprised Messrs. W. T. Macoun, Dominion Horticulturist (chairman); H. J. Moore, Islington, Ont.; Jas. E. Carter, Guelph, Ont.; S. F. Davidson, Fonthill, Ont., and Professor F. E. Buck, University of British Columbia, Vancouver, B.C. The report was adopted after careful consideration by the directors of the Horticultural Council.

The directors and the members of the committee afterwards waited upon the Dominion Minister of Agriculture, Hon W. R. Motherwell, and made a request for a grant to assist in financing the undertaking.

In the preamble to the report the two-fold purpose of plant registration is defined as follows:—(1) To make available the results of the work of the thousands of amateur plant breeders; (2) To provide some means of recognition and protection to the plant breeder as an inducement to him to submit the results of his work.

Since the formation of the committee, each member has expended a great deal of his time in investigating the possibilities of bringing plant registration into effect in the Dominion of Canada. The opinions of a large number of interested persons in Canada, the United Kingdom, the United States and in European countries have been secured. These agree that the scheme is practicable, and that if brought into effect, great benefit would accrue, not only to Canadian horticulture but to horticulture in general.

The committee also had in mind the placing of the plant-breeder on a plane with the inventor. At present anything new, outside the realms of living matter, may be patented, and by this means the inventor is enabled to reap a financial reward The investigator in the field of living matter, however, has no such incentive before him, and although his originations may be of untold value to mankind, his own reward, if any, is insignificant.

A Bureau of Plant Registration would protect the plant hybridist and take plant breeding out of the unprofitable professions and place it where it belongs among the callings that confer lasting benefits upon society.

By membership in the International Federation of Professional Horticulturists—a Federation of the Horticultural Associations of Great Britain, France, Italy, Holland and Belgium—the council will secure full advantage of the International Plant Registration Bureau, and thus make at once available for Canadian growers the findings of European investigators.

The report continues as follows:—

(1) "The Registration Committee named by the Council will name a provincial representative for and in each

province. The Committee will also name separate committees to advise regarding classes, such as gladioli, paeonies, roses, etc., for recording.

(2) "By recording, the Registration Committee does not establish the particular value or general characteristics of new plants, but only settles the right of priority of the naming of the new plant. The Registration Committee may conduct further investigations and, if satisfied that the new plant is worthy of registration, such registration shall indicate that the new plant is considered to be of outstanding merit.

(3) "Only herbaceous horticultural plants, shrubs or trees will be accepted for recording.

(4) "Any variety that is not recognized as being in existence at time of application may be recorded, but a variety to be registered must first be tested and found to be of outstanding merit.

(5) "A fee of five dollars ($5) shall accompany each application from Canada and of ten dollars ($10) from points outside of Canada. If the variety is not recorded, the fee, less expenses incurred, will be returned.

(6) "Each application for recording will be forwarded first to the provincial representative, who will satisfy himself that the application covers a new variety.

(7) "The description given must not bring into comparison any other variety already known in the trade, in such a way as to discredit this other variety.

"Should the Committee think that the description given is likely to prejudice another variety, they will ask the applicant to alter the terms of the description. If he declines to do so, recording may be refused and the fees returned less the expenses incurred.

(8) "The application will supply the following information:—

(*a*) The full name of the raiser of the plant;

(*b*) The full name of the seller, if necessary;

(*c*) The name of the new plant;

(*d*) A brief description of the new plant;

(*e*) Conditions under which the raiser wishes to sell or distribute the new plant.

(9) "The application with supplementary description (and specimens if possible) will be forwarded by the provincial representative to the Secretary of the Council.

(10) "An index will be maintained in the office of the secretary in which will be recorded the complete name and, where possible, the description of every known variety of herbaceous horticultural plant, shrub or tree. Each application received will be checked with the index in order to assure that the name applied for is not already in use.

(11) "After checking, the application (and specimen if possible) will be forwarded to the Dominion Horticulturist for a report as to whether, in his opinion, the variety is new and is properly described in the application.

(12) "The report of the Dominion Horticulturist, with the application and all information regarding it, will be placed before the next meeting of the Registration Committee, which will decide whether the variety shall be recorded.

(13) "If the Registration Committee accepts the application, all information concerning same shall be entered in numerical order in a special book which will be so arranged as to provide for recording: (a) the genus of the plant; (*b*) the indication of the variety; (*c*) name given to the new variety; (*d*) name of the raiser, and, if necessary, of the seller; (*e*) address of the declarer; (*f*) description, and (*g*) such other information as is deemed necessary.

(14) " All entries will be posted from the recording book to other secondary books according to the great divisions in horticulture, and subdivided in categories so as to allow proper classification.

(15) "As soon as convenient, following the recording, the Secretary of the Council will send to the horticultural papers for the first publication information as outlined in section 8 (*a*), (*b*), (*c*) and (*d*).

(16) "If, in the course of the six months following the first publication of a name, it becomes known to the Registration Committee that this name was employed previously for a variety of the same genus, and that this variety is still in existence in cultivation or in collections, the raiser will be invited to change the name, so as to avoid duplication.

(17) "An endeavour will be made to have horticulturists who publish catalogues or lists, including new plants, mention, during at least the three years following the date on which the plant has been put on the market, the name of the registrar of each new plant.

"Should a horticulturist publish lists of new plants without mentioning the names of the raisers, the Registration Committee will advise him that such a practice does not meet the approval of the committee. If after due notice given as above, a horticulturist still refuses to mention the names of the raisers of new plants included in his list, the committee will have power to decline any further application from him.

(18) "The raiser will have the right to include in the conditions of sale of new plants the obligation of mentioning his name when the plants are included in catalogues, for a period other than indicated in clause 17 above, or even indefinitely.

"The raiser has the right to specify all the conditions he thinks necessary to safeguard his interests, present and future, moral and material.

(19) "When a new plant is put on the market by a person other than the raiser, the name of the propagator should be given.

(20) "All persons who have secured the recording or registration of new plants will be required to exhibit or show same at a provincial exhibition, recognized by the Council, within a period of two years from the date of registration. Failing this the registration will be cancelled. The new plants need not be exhibited as mentioned above if they are offered for sale within two years of the date of registration. However, if the plants are not offered for sale within six years of the date of registration this may be cancelled. The fees charged for cancelled registration are not returnable.

"The cancellation of a registration will only be compulsory if it has been demanded by one or several persons interested in the matter.

(21) "The Council will make the final decision in case of dispute between an applicant, applicants, or other parties and the Registration Committee.

(22) "In order to avoid duplication of names and to give international effect to recording and registration, the committee will co-operate with every known horticultural society or agency."

At a meeting of the Plant Registration Committee after the meeting of the Directors the following were named and are being requested to act as provincial representatives of the committee:—

British Columbia.—Professor F. E. Buck, University of British Columbia, Vancouver, B.C.

Alberta.—W. F. Broadstock, Secretary, Edmonton Potato Growers, Edmonton, Alta.

Saskatchewan.—Dr. C. F. Patterson, University of Saskatchewan, Saskatoon, Sask.

Manitoba.—Prof. F. W. Broderick, Agricultural College, Winnipeg, Man.

Ontario.—H. J. Moore, Islington, Ont.

Quebec.—Professor T. G. Bunting, Macdonald College, Que.

Prince Edward Island.—J. A. Clark, Superintendent, Dominion Experimental Farms, Charlottetown, P.E.I.

New Brunswick.—A. G. Turney, Provincial Horticulturist, Fredericton, N.B.

Nova Scotia.—W. S. Blair, Superintendent, Dominion Experimental Farms, Kentville, N.S.

Yukon.—Mr. James Farr, Swede Creek, Dawson.

Steps are being taken to prepare an index of the recognized names of all herbaceous horticultural plants, shrub or trees, and it is expected that the Plant Registration Bureau will be in a position to accept applications for recording and registration at an early date.

Any further information regarding the Bureau of Plant Registration will be cheerfully given by the Secretary, Mr. L. F. Burrows, 21 Cliff Street, Ottawa, Canada.

DOMINION LIVE STOCK BRANCH CONFERENCE

AT the instance of the Honourable W. R. Motherwell, Minister of Agriculture, the senior officers of the Dominion Live Stock Branch met in conference at Ottawa during the latter part of November, with a view to further co-ordinating the work of the branch as carried on in the various provinces of the Dominion. A critical study was made of the whole commercial live stock situation as it relates to the promotion work of the department through the Live Stock Branch.

The conference, the first of its kind to be held by the branch, was addressed by the Hon. W. R. Motherwell, Minister of Agriculture, Dr. J. H. Grisdale, Deputy Minister, and the Dominion Live Stock Commissioner, Mr. H. S. Arkell, who presided. These speakers strongly emphasized the national importance of the work in which the officers of the branch were engaged.

The conference was brought to a fitting conclusion on the evening of December 1, when those in attendance were entertained by Mr. Motherwell at the Chateau Laurier. Mr. Motherwell was unfortunately unable to be present. The evening's programme included several interesting and instructive addresses. Dr. Grisdale ably summarized the present condition of the live stock industry and trade as related to the British market, referring, in particular, to the need for improvement as to quality and uniformity in Canadian live stock and live stock products. Some very practical advice was given as to ways and means of meeting the keen competition existing in the overseas market. Mr. J. A. Ruddick, Dairy and Cold Storage Commissioner, gave an interesting address on several phases of British and New Zealand agriculture. Mr. James Telfer, one of the senior officers of the branch, carrying on extensive promotion work in Ontario, spoke on behalf of the branch, and gave an able summary of the development of the work, particularly in the older settled sections of the Dominion. Mr. Telfer stressed the importance of developing the co-operative phase in marketing.

The conference provided, among other things, a means whereby the key men in the field could become intimately acquainted with the directing staff at headquarters and gain from an entirely new angle, a comprehensive view of the whole live stock policy in general and their own duties in particular. They returned to their duties immeasurably strengthened by their contact with headquarters.

50572—5½

EXTENSION OF GRADING SEED FOR EXPORT

THE principle of grading seed for export was adopted in respect of fibre flax seed at the request of the Irish Board of Agriculture, and has been in effect during the past four seasons, much to the satisfaction of all concerned. It is now extended to Canadian-grown alsike and red clover seeds, according to a plan designed by Mr. Carl Sweet, Chief of the Seed Division.

Type samples of alsike seed, representing each of five shades of colour under general quality for each of Extra No. 1, No. 1 and No. 2 purity standards, have been supplied to the principal importers of Great Britain and to Canadian exporters. On receipt of application for export inspection at the office of a district seed inspector, samples of the seed will be drawn by an official inspector, who will have them analyzed and graded at the district laboratory. The inspector will then seal the seed in the sack, attaching the certificate of grade in the form of a tag back of the metal seal.

According to the plan a Canadian exporter by the use of one code word, "Headactw," may indicate that he offers No. 2 alsike seed, medium green type sample, containing 94 per cent by weight of pure alsike seed, 4 per cent by weight of white clover seed, free from dodder, and containing not more than one-fifth of one per cent by number of the weed seeds prescribed by the British Seeds Act.

The selling of seed for export on the basis of Canadian inspection and grades is optional with the exporter. The new Seeds Act of Great Britain, now in force, would appear to make the adoption of the system advantageous to Canadian seed growers and exporters. The Seed Branch of the Dominion Department of Agriculture has an organization that is competent to provide the grading and inspection service to all parts of Canada.

AGRICULTURAL COLLEGE REGISTRATION

The following is a statement of the 1922-23 registration at the Agricultural Colleges designated below:—

ONTARIO AGRICULTURAL COLLEGE

Agricultural Courses—		
First Year Associate	51	
First Year Degree	37	
Second Year Associate	35	
Second Year Degree	33	
Intermediate Year	15	
Third Year	45	
Fourth Year	146	
		362
Home Economic Courses—		
Normal Course—First Year	11	
Second Year	17	
Associate Course—First Year	40	
Second Year	26	
Institutional Management—First Year	8	
Second Year	11	
Home Maker Course	40	
Short Course	16	
Optional Course	4	
		173
Total		535

MACDONALD COLLEGE

School of Agriculture—		
B.S.A. Fourth Year..	21	
Third Year..	10	
Second Year..	12	
First Year..	14	
B Sc. in Agr. Fourth Year..	1	
Winter Course in Agriculture..	18	
Special..	4	
(Also 6 students under Faculty of Graduate Studies and Research)		
		80
School for Teachers—		
Intermediate..	172	
Kindergarten Directors..	0	
Elementary (first term)..	30	
		202
School of Household Science—		
B.H.S., Fourth Year..	4	
B.H.S., Third Year..	3	
Institution Administration, Seniors..	13	
" " Juniors..	12	
Homemakers..	36	
Special student..	1	
Student-worker..	1	
		70
Summer School for Rural Improvement, 1922..		96
Summer School in Public School Drawing, 1922..		85
Total..		533

MANITOBA AGRICULTURAL COLLEGE

Agricultural Courses—		
First Year Degree..	18	
Second Year Degree..	14	
Third Year Degree..	11	
Fourth Year Degree..	17	
Fifth Year Degree..	12	
First Year Diploma..	28	
Second Year Diploma..	26	
Third Year Diploma..	11	
		137
Home Economics—		
First Year Degree..	12	
Second Year Degree..	15	
Third Year Degree..	9	
Fourth Year Degree..	19	
Fifth Year Degree..	9	
First Year Diploma..	34	
Second Year Diploma..	14	
		112
Engineers..		12
Total..		261

UNIVERSITY OF SASKATCHEWAN, COLLEGE OF AGRICULTURE

Agriculture—		
Degree Course..	80	
Associate Course..	72	
		152

UNIVERSITY OF ALBERTA, COLLEGE OF AGRICULTURE

First Year..	25	
Second Year..	28	
Third Year..	12	
(Combined Course Arts and Agriculture)..	11	
Graduate Course..	3	
Bachelor of Household Economics..	6	
Total..		85

Nearly all the above attended a School of Agriculture as a prerequisite to entering the University.

UNIVERSITY OF BRITISH COLUMBIA, COLLEGE OF AGRICULTURE

***Agriculture* (Four Year Course)—**		
First Year..	32	
Second Year..	17	
Third Year..	15	
Fourth Year..	12	
Graduates..	8	
Total..		84

NOVA SCOTIA COLLEGE OF AGRICULTURE

***Agriculture* (Two Year Course)—**		
Seniors..	24	
Juniors..	20	
Total..		44

WORLD'S DAIRY CONGRESS

Acting under the authorization of a law passed in 1921, the President of the United States has issued invitations to 150 nations, commonwealths and colonies to send official representatives to the World's Dairy Congress, to be held in the United States in October, 1923, at a point to be selected later.

The proposed congress, which was initiated by the United States Government through its Department of Agriculture, will comprise dairy scientists and representatives of the dairy industry generally—that is to say, producers, manufacturers and distributors. These interests in the United States have organized a World's Dairy Congress Association which will conduct the congress in co-operation with the Department of Agriculture. The International Dairy Federation, of which M. Maenhaut of Belgium is President, will also co-operate.

The dairy interests in each country are invited to co-operate with the Association in organizing a group of delegates representing the greatest possible number of scientific branches and business lines concerned with dairying.

The programme committee is seeking to arrange a programme that will interest four groups of people—those devoting their attention to "Research and Education"; to "Industry and Economics"; to "Regulation and Control," and to "National Health."

The National Dairy Association will hold its annual exhibition immediately following the congress, and in the same city. This exhibition annually brings together about 1,000 of the best bred cattle of the United States and Canada, while its mechanical and other exhibits are of great importance. Intending exhibitors should communicate with the National Dairy Association, 910 South Michigan Avenue, Chicago, Ill., U.S.A.

"PLANT BREEDING IN SCANDINAVIA"

Translated into Japanese

In the autumn of 1912 there appeared in Canada a publication of more than usual interest to plant breeders and others interested in the general problem of crop improvement. This publication, consisting of 195 pages, profusely illustrated and entitled "Plant Breeding in Scandinavia," was written by Mr. L. H. Newman, Secretary of the Canadian Seed Growers Association, Ottawa. Mr. Newman spent almost a year in Scandinavia investigating the excellent work that had been done and was still in progress in that remarkable country. The work of the General Swedish Seed Association, the headquarters of which are located at Svalöf in Southern Sweden, engaged his greatest attention. This famous organization came into existence in 1886, since which time it has progressed gradually until to-day it is considered one of the foremost institutions of its kind in the world. From a scientific as well as a practical standpoint its contributions to agriculture rank among the most valuable. "Plant Breeding in Scandinavia," traces in a very lucid and complete manner the development of the work at Svalöf from the beginning and shows how the early ideas as to how plant life may be made more fruitful gradually were made to give place to others of a more exacting nature. In commenting on this book Dr. Hans Tedin, a leading member of the staff at Svalöf, says, "this is the first complete and accurate exposition of our work that has ever been published in any language." While the Canadian Seed Growers' Association published the book chiefly for the benefit of students in plant breeding in Canada, the work quickly became recognized in other countries and soon came to be used as a text book for advanced classes in the leading Agricultural Colleges and Universities of the world. Among those institutions to make greatest use of this work was the Imperial University of Japan. After purchasing many English copies for its students it finally decided to ask permission to translate the book in toto into the Japanese language. This was granted, and quite recently the work appeared in Japanese.

NOTE.—English copies of this publication may be had at the office of the C.S.G.A., 114 Vittoria Street, Ottawa, price $1.75 (bound) and $1.50 (paper).

CATTLE AND BEEF EXPORTS

The following tables show the quantity and value of cattle and beef exported from Canada during the five years 1917-21:—

CATTLE, 1917-21

Year	Number	Value
1917..	195,529	$14,319,241
1918..	240,094	21,399,870
1919..	546,490	51,038,270
1920..	303,456	22,402,499
1921..	232,267	9,881,037

BEEF, 1917-21

Year	Quantity	Value
1917..	832,017 cwt.	$12,116,793
1918..	1,254,607 "	24,860,381
1919..	1,064,732 "	20,092,354
1920..	644,120 "	10,702,829
1921..	319,289 "	3,957,280

NEWS ITEMS AND NOTES

The Dominion Minister of Agriculture, the Hon. W. R. Motherwell, has appointed a committee of enquiry into the matter of federal assistance to agricultural exhibitions. The committee consists of Dr. J. H. Grisdale, Deputy Minister of Agriculture, H. S. Arkell, Live Stock Commissioner, F. L. Fuller, Truro, N.S., S. E. Francis, Sherbrooke, Que., and D. T. Elderkin, Regina, Sask. Meetings have been called at Brandon, Man., and Ottawa.

The Fourth Canadian Egg-Laying Contest conducted by the Dominion Experimental Farm at Ottawa started on November 1, 1922, and will continue for 52 weeks. The entries were: Ontario, 50 pens, United States, 8 pens, Quebec, 4 pens, British Columbia, 4 pens, New Brunswick, 3 pens, and Manitoba 1 pen; total 70 pens. By breeds, the number of pens is as follows: White Leghorns, 31, Barred Plymouth Rocks, 27, White Wyandottes, 7, White Rocks, 2, and one pen each of Rhode Island Reds, Anconas and Chanticler.

The Experimental Farm pens and those of the Agricultural Colleges are entered for Record of Performance purposes only.

It was not until as late as 1910 that fox-breeding became a recognized industry in Canada. In that year a pair of foxes sold for $3,000, and in 1913 a pair sold for $20,000, but the top price was reached when $35,000 was paid for exceptional specimens. At the height of the boom speculators took options on unborn pups. The war brought an end to such practices, and the industry became stabilized. To-day, the market value of foxes per pair ranks from $500 and upwards, according to quality and performance. It is estimated that in 1921 over 600 pair of live foxes were exported from Prince Edward Island and that 6,000 pelts were sold, the average price of which was $275 per skin.

While the Province of Prince Edward Island must be credited with the inception of fox breeding as a commercial prospect, the business has spread until ranches now exist in all the provinces.

A great deal of attention has been devoted to the origination of new varieties of apples by the Horticultural Division of the Dominion Department of Agriculture. The work began over twenty-five years ago, and at that time there were only about five varieties of winter apples that were hardy in the Ottawa district. Since then, some two hundred hardy varieties of winter apples have been originated, some of which are likely to be of value in the colder parts of Canada.

Of the autumn varieties originated at the Central Experimental Farm, several are outstanding and are likely to become popular. These are Melba, Joyce, Patricia, and Pedro. In the winter section, Mendel, a seedling of Wealthy is claiming attention.

The Dominion Experimental Station at Morden, Manitoba, claims to have the best collection of hardy apples and crab apples in America.

"One of the secrets of the success of New Zealand cheese on the British market—not, of course, the only reason—is the fact that the obligation is imposed by law of leaving all cheese on the curing-room shelves at least fourteen days before it is shipped."

Imperial Food Journal

The European Corn Borer scouting work in southern Ontario during the season of 1922, covered 165 townships of which 45 were found infested and later quarantined. The Corn Borer has spread over Essex, Kent, Lambton and part of Huron counties, as well as along the Lake Ontario shore as far east as Brighton.

The Dominion Government will build a potato warehouse at St. John, New Brunswick, to assist in the marketing of the potato crop. It is expected that a market for New Brunswick potatoes will be found in Florida and the West Indies, the purpose of the warehouse being to carry the potatoes until they can be shipped.

Mr. A. H. White, B.S.A., Chief Dairy Promoter, has been awarded a Fellowship in Dairying from the Iowa State College and has been granted leave during the winter months to take up post-graduate work in the dairying department of that institution

---

For the twelve months ending with September, 1922, Canada exported 17,994,188 pounds of butter, valued at $6,705,240, compared with 9,140,561 pounds in 1921, valued at $4,075,656.

Mr. Jas. E. Carter of Guelph, Ontario, has offered to donate the sum of one hundred dollars annually to be used for the purchase of a medal, known as The Carter Medal, to be given to the person who, in the opinion

of the Canadian Horticultural Council, did the most valuable work for the advancement of horticulture in Canada during the previous year. The Directors have accepted Mr. Carter's offer, and will name a Committee to recommend at the next annual meeting of the Council the person to whom the medal for the year 1922 should be awarded.

The official opening of the Ontario Veterinary College, which has been transferred from Toronto to Guelph, took place on December 1, 1922. The Hon. Manning Doherty, Minister of Agriculture for the Province of Ontario, was present and performed the opening ceremonies. Those present included many prominent representatives of the veterinary profession from various parts of the Dominion.

There are 83 students in attendance.

On account of the success of the three-month courses in agriculture and domestic science, held during the winter of 1921-22, the Ontario Minister of Agriculture has decided to increase the number of these schools to eight. Last winter, four schools were held, namely, in the counties of Huron, Middlesex, Wentworth and Peel These are being continued, though at different points in the county. The extension will include the counties of Peterborough, Simcoe, Prince Edward, and Leeds. The courses open at the end of November and conclude early in March. They are under the direction of the local Agricultural Representative of the Department, assisted by a graduate in Domestic Science and a competent staff of lecturers.

A markets conference under the auspices of the department of Farm Management of the Ontario Agricultural College will be held at Guelph at the time of the annual meeting of the Ontario Experimental Union and of the Western Ontario Dairymen's Association early in January. The conference was successfully initiated a year ago, and is likely to become an annual event, its object being to present accurate information in regard to the farmer's marketing problems. The above arrangements constitute part of a plan to gradually develop an annual agricultural conference or "Farmers' Week" at the College.

Arrangements have been made for the holding of a "Home and Community" short course of one week, commencing January 16, at the Ontario Agricultural College, Guelph. The subjects to be taken up will include, farm economics, sanitation, soil improvement, and school and club organization.

Many city, state and national campaigns, based upon scientific investigation into the value of dairy products in developing normal child life and in maintaining the vigor of adults, have been conducted recently in the United States. In the two-year period 1919-21, the consumption of whole milk in the homes increased 6,524,000,000 pounds (2,959,000,000 kilograms), in 1921 household consumption totalling 45,143,000,000 pounds (20,476,000,000 kilograms). Nearly as great an increase occurred in the use of whole milk for manufacturing purposes, the total used for this purpose in 1921 reaching 46,493,000,000 pounds (21.089,000,000 kilograms).

The United States had 23,916,000 dairy cows in 1919, and its milk production amounted to 90,058,000,000 pounds (40,850,000,000 kilograms). In 1921 its dairy cows numbered 25,061,000 and its milk production amounted to 98,862,000,000 pounds (44,843,000,000 kilograms).

While there have been conducted in this country no extensive surveys which can be used for national application, the results of such surveys in the United States and in various cities and localities in Canada show a great similarity, and indicate that from 20 to 33⅓ per cent of the total number of children of pre-school and school age are "sufficiently under-weight to require treatment for malnutrition." The findings of the Montreal Canadian Patriotic Fund Health Clinic approximated more nearly the higher estimate of 33⅓ per cent. Out of three groups of 1,000 children, the numbers of undernourished were respectively 299, 260 and 204. Dr. Wood of Columbia University, New York, from a careful study of half a million country and city children, estimates that 16·6 per cent rural children and 7·6 per cent city children are undernourished. The view that there is as much, and, in many districts more, undernourishment among country children than among city children is shared by many public health nurses and other workers. It is significant, too, that those who have made a study of the situation hold the view that country children use no more, and, in many cases much less, milk than is used by the children in urban centres

---

During 1921 a survey of the cold storage plants in Saskatchewan was made with a view to obtaining exact information on the facilities provided for the proper storage of food stuffs.

There were thirty-four plants in the province equipped with mechanical refrigeration. These plants have a total refrigerated space of 1,859,070 cubic feet and are widely distributed over the province. Seven of the plants are operated either as general public cold storages or as coolers and storages in connection with abattoirs. The remaining twenty-eight are operated either as private

creamery storages or combination public and creamery cold storages.

The increase in the number of milch cows in the province of Saskatchewan in 1921 over the previous year was 67,199, or 18·9 per cent.

Saskatchewan reports a much greater interest than ever before in the growing of all kinds of forage crops, not only for winter feeding, but for late summer and fall pasture. This is said to be due not only to the extension of dairying but to more live stock raising or better balanced farming generally.

Nutrition specialists at the Cornell College of Agriculture, have made an estimate, for the guidance of the housekeeper, of the amounts of canned and preserved fruits and canned vegetables needed to keep a family of five well nourished for a year. The following is the recommendation: The use of tomatoes four times a week, of green vegetables six times, of starchy vegetables three times, and of fruits ten times a week. The quantities of food such a family might well use are about 80 quarts of tomatoes, 120 quarts of green vegetables, 50 quarts of starchy vegetables, 220 quarts of fruits, and 40 quarts of conserve, jam and jellies.

Because of the presence of anti-scorbutic and water-soluble vitamins, tomatoes are provided in quantity, but the use of oranges at certain seasons of the year may reduce the amount of tomatoes used. Either oranges or tomatoes are desirable for children throughout the year.

The amount of stored vegetables, such as cabbages and celery, will also affect the quantity of vegetables to be canned, and the amount of fresh or dried fruits such as apples, prunes and oranges provided during the year, must also be considered in estimating the amount of fruit to be canned or preserved.

In 1922, in the province of New Brunswick, over seventy schools held school fairs of their own or took part in united school fairs. This was a considerable increase over the previous year, and is an evidence of a growing interest on the part of parents, pupils, and teachers.

The New Brunswick Rural Science School held during the summer of 1922 was the largest for some years and the camping accommodation was taxed to its utmost capacity. Every student and member of the staff lived in camp. The total cost per person for the month was $17. This was further reduced by the payment of the Agricultural Instruction bonus to those taking up the work in their schools.

The following courses were given: Nature Study; Physics of the Farm and Home; Cereal Husbandry and Plant Physiology; Horticulture and School Gardening. An additional course in Rural Recreational Work was given, and was much appreciated by the student teachers. Games were taught by playing them; and they may be taught to children in a similar manner. Some time also was spent on the theory of play in schools. The camp life proved to be a real recreation; the swimming pool, the games, the social evenings, and the excursions—all were features worth remembering.

APPOINTMENTS AND STAFF CHANGES

Mr. Leonard C. McOuat, B.S.A. (Macdonald), has been appointed as Bacon Specialist to the Live Stock Branch, to conduct research into methods of curing and packing bacon for export.

Messrs. John K. McKenzie, B.S.A., and Ernest R. Hall, B.S.A., have been appointed Assistants to the Superintendent at the Dominion Experimental Farms at Swift Current, Sask., and Morden, Man., respectively.

Mr. Frank A. Herman, B.Sc., has been promoted to Assistant Chemist in the Chemistry Division of the Dominion Experimental Farms Branch.

Mr. Joseph F. X. Robitaille, has been appointed Assistant to the Superintendent at the Experimental Station, Cap Rouge, Que.

The Dominion Entomologist announces the following appointments to the staff of the Entomological Branch:—

Mr. C. H. Curran, B.S.A. (Guelph), M.Sc., Assistant Entomologist, Division of Systematic Entomology. Mr. Curran received his Master's degree from Kansas University.

Mr. E. R. Buckell, B.A. (Cambridge), Assistant Entomologist, Division of Field Crop and Garden Insects.

Messrs. R. M. Twinn, B.S.A. (Guelph), R. H. Painter, B.S.A. (Guelph), and R. Glendenning have been appointed Junior Entomologists.

Messrs. Arthur Finnamore and Norman Cameron have been appointed Insect Pests Investigators in the Division of Foreign Pests Suppression.

The Dairy and Cold Storage Commissioner announces the following permanent appointments of Dairy Produce Graders at Montreal: J. U. Maher; Pierre Labbe; T. J. Hicks; Thos. W. Grieve. Also the following Assistant Graders: R. Omer Hebert; Harold M. Ward.

The following have been appointed Supervising Analysts to the Seed Branch: Mr. George E. Grattan, M.A., formerly of the Food and Drug Laboratories, Department of Health; Mr. F. T. Wahlen, D.Sc., of Zurich, Switzerland, and Mr. C. W. Leggatt, B.S.A., formerly of the Department of Chemistry at the Ontario Agricultural College.

Mr. R. D. Sinclair has been appointed Assistant Professor of the Animal Husbandry staff of the College of Agriculture, University of Alberta. Mr. Sinclair is a graduate of that institution, having won the Governor General's gold medal on graduation. His home is in Alberta, on a farm near Innisfail; on which farm some of Alberta's best Shorthorns have been bred.

Dr. J. G. Jervis of Milner, B.C. has been appointed lecturer in Veterinary Science at the University of British Columbia to succeed Dr. T. H. Jagger who resigned.

Mr. E. Eric Boulden, a graduate of the Nova Scotia Agricultural College and of Macdonald College, Quebec, has been appointed professor of Agriculture in the Technical and Agricultural School at Charlottetown, Prince Edward Island.

ASSOCIATIONS AND SOCIETIES

CANADIAN NATIONAL POULTRY ASSOCIATION

A general meeting of the Canadian National Poultry Association was held in Ottawa on October 18, 1922. There were present, in addition to the officials of the Poultry Division of the Experimental Farm and of the Live Stock Branch, the heads of the Poultry Divisions of the Nova Scotia, Quebec, Ontario and Manitoba provincial Departments of Agriculture, and a number of prominent poultry breeders. A discussion of pedigree registration of poultry occupied most of the time of the meeting. Dr. Robert Barnes, in his presidential address, explained that the executive committee had, in accordance with instructions from the meeting in March, 1920, completed the constitution providing for pedigree registration. This, he explained, had been submitted on two occasions to the Department of Agriculture with a view to its incorporation under the Live Stock Pedigree Act, but had been found unsatisfactory. The proposed constitution presented to this general meeting was a revision in accordance with suggestions made by the Deputy Minister. Considerable difference of opinion arose as to the proposed requirements for registration covering only birds qualifying in the egg-laying contests conducted by the Experimental Farms. Prominent breeders present expressed the view that such registration was too limited, and that it would be better to conform to the provisions of the original proposal to admit birds qualifying in Record of Performance 'A' and 'AA', and a resolution to this effect was passed. The proposed new constitution was therefore rejected and it was decided to again present the original draft for incorporation with minor amendments.

The Minister of Agriculture, Hon. W. R. Motherwell, who addressed the meeting, cautioned the Association against too rapid progress, and advised against the adoption of a standard so high as to be difficult to maintain or control.

The United Seed Growers Limited.—The object of this association is to encourage the production of field, root and vegetable seed in British Columbia. The head office and cleaning plant is at Penticton.

President, L. E. Taylor; Vice-president, C. B. Craig; Manager, I. Travis.

Western Canadian Society of Agronomy.—Membership consists of persons who are engaged in teaching or in scientific investiga-

tion in some branch of Agronomy, and other persons interested in the objects of the Society.

Officers for 1922: Prof. G. H. Cutler, University of Alberta, President, Mr. W. H. Fairfield, Superintendent, Dominion Experimental Station, Lethbridge; Vice-president, Prof. Roy Hansen, University of Saskatchewan, Secretary-treasurer.

British Columbia Veterinary Association.—President, G. Howell; Vice-president, T. R. Hoggan; Secretary-treasurer and Registrar, Kenneth Chester, New Westminster, B.C.

Ontario Co-operative Dairy Products Limited.—President, John Beatty, Mallorytown; Secretary, E. H. Stonehouse, Weston.

Saskatchewan Co-operative Elevator Company.—The annual meeting of the Saskatchewan Co-operative Elevator Company was held in the City Hall, Regina. Three hundred and twenty-eight delegates were present representing 23,014 shareholders. Hon. Geo. Langley, President of the Company presided. The Company shows a net profit on the year's operations of $463,-056.63 and a cash dividend of 8% has been paid to the shareholders. During the year, which ended July 31, 1922, 332 elevators were operated and handled a total of 34,769,-955 bushels of all grains. In addition 2,565,422 bushels were handled over the platform.

Alberta Hereford Breeders' Association.—At the annual meeting of the Alberta Hereford Breeders' Association, held in Calgary, the following officers were elected for 1923:—President, O. A. Boggs, Daysland; Vice-president, John Wilson, Innisfail; Secretary-treasurer, Thomas Bellew, Calgary.

QUEBEC DAIRY ASSOCIATION

The annual convention of the Quebec Dairy Association was held at Roberval, county of Lac Saint Jean, on November 22 and 23, 1922. The attendance at the conference was larger than the hall could accommodate, and was among the most successful hitherto held.

The region is noted not only for its natural beauty, but also for the prosperity of its farmers. The dairy industry has entirely revolutionized farming in this district since 1882, when the Dairy Association was founded, and, as elsewhere, has contributed greatly to the prosperity of the community. To-day, in the county of Lac Saint Jean alone, there are 86 cheese factories and 14 combined factories. In 1911, butter and cheese manufactured in this county was valued at $579,818 and in 1921, at $1,199,295. These figures show the extent of the industry.

Subjects of first importance were discussed Mr. Omer Tessier, professor at the Dairy School, and assistant inspector general of the butter and cheese factories, spoke on the "Payment of Milk on a Basis of Fat Content"; Mr. H. C. Cornelier on "Co-operation in Dairy Industry"; Mr. Stephane Boily, B.S.A., on "Hygiene"; Mr. Elie Bourbeau, on "Development of Dairy Industry at Lac Saint Jean"; Reverend O. L Martin, Inspector of Schools of Household Science, on "Milk in the family, and at the factory"; Mr. L. P. Lacoursiere, on the "Conditions required to make choice butter"; Dr. J. C. Chapais, "Guide for the study of Vitamines"; Miss Eveline Leblanc, "Milk"; Mr. A. T. Charron, "Chemical Fertilizers"; Mr. Desilets, "Farm Women's Circles"; Mr. A. Raymond, "Aviculture; Mr. P. Rodrigue, "Rearing of Live Stock."

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

Practical plant biology, by H. H. Dixon. 1922. 291 p. il.

Outlines of general biology, by C. W. Hargitt. 1922. 184 p.

An indexed system of veterinary treatment, by W. Scott. 1922. 636 p. il.

Wholesale distribution of fresh fruits and vegetables, by R. G. Philips. 1922. 256 p.

Motion picture projection, by J. R. Cameron. 1922. 1088 p. il.

Man,—The animal, by W. M. Smallwood. 1922. 233 p.

Textbook of pomology, by J. H. Gourley. 1922. 380 p. il.

Power alcohol, its production and utilization, by W. G. Monier-Williams.

Fungi, by H. Gwynne-Vaughan. 1922. 232 p. il.

A handbook of some South Indian grasses, by R. B. K. R. Achariyar. 1921. 318 p. il.

Pasteur and his work, by L. Descour. 1922. 256 p.

Management and diseases of sheep in Australia. 1920. 169 p. il.

Village improvement, by P. T. Farwell. 1918. 362 p. il.

Labrador, the country and the people, by W. T. Grenfell. 1922. 528 p.

Contributions from the laboratory of entomology of the Bussey institution of applied biology. 4 volumes.

The adventures of Maya the bee, by W. Bonsels. 1922. 224 p.

Art of grafting in India, by G. B. Set, B.A. 1920. 74 p. il.

Feeding dairy cattle, by E. S. Savage. 1922. 118 p.

The relation of temperature, humidity and pressure to dairy operations, by W. W. Fisk. 1922. 80 p. il.

The horse as comrade and friend, by E. R. Calthrop. 1922. 243 p.

Army veterinary service in war, by Maj. Gen. Sir John Moore. 1921. 191 p. il.

Everybody's dog book, by Major A. J. Dawson. 1922. 293 p. il.

Twentieth century bird, dog training and kennel management, by E. M. Shelley. 1921. 98 p. il.

A study of farm animals, by C. S. Plumb. 1922. 551 p. il.

Animal nutrition: collected papers. 1912-1922, by H. P. Armsby. 1922.

A textbook of plant biology, by W. N. Jones. 1920. 262 p.

Catalysis in theory and practice, by E. K. Rideal. 1919. 496 p. il.

Development and activities of roots of crop plants, by J. Weaver. 1922. 171 p. il.

Species and varieties, their origin by mutation, by H. de Vries. 1912. 847 p.

Petroleum, by H. B. Cronshaw. 1921. 110 p.

Laboratory directions for elementary botany, by J. B. Pollock. 1922. 102 p.

Biology, by C. Gramet. 1920. 115 p.

Atlas des champignons comestibles et vénéneux, by M. J. Costantin. 257 p. il.

A study of price control by the U.S. food administration, by J. C. Bartley. 1922. 139 p.

Statistics and their application to commerce, by A. L. Boddington. 1921. 220 p.

First principles of advertising, by W. B. Nesbitt. 1922. 110 p.

The control and distribution of production. by C. H. Douglas. 1922. 175 p.

Wheat costings, 1914-1922. by H. Grange, 1922. 16 p.

What's back of marketing, by Dr. H. C. Taylor. 1922. 56 p. il.

The co-operative elevator movement, by J. B. Kennel. 1922. 155 p.

Outline of economics, by E. B. Riley. 1922. 101 p.

Principles of the new economics, by L. D. Edie. 1922. 525 p.

Cow-keeping in India, by Isa Tweed. 1920. 415 p. il.

Les animaux de la basse-cour, by G. Legendre. 256 p. il.

The A B C of egg production, by E. T. Brown. 1921. 89 p. il.

Home doctoring of goats, rabbits and poultry, by R. E. Davies. 1921. 55 p.

The British goat society's year book 1922. 136 p. il.

Productive farming, by K. C. Davis 1920. 442 p. il.

Reindeer and musk-ox. 1922. 99 p. il.

British bee-keeper's guide book, by T. W. Cowan. 1921. 226 p. il.

Genetic studies of rabbits and rats, by W. E. Castle. 1922. 54 p. il.

Instructions pour les bergers et pour les propriétaires de troupeau. 1782. 416 p. il.

Glasshouses and the propagation of plants, by F. J. Fletcher. 73 p. il.

Fungous diseases of plants, by B. M. Duggar. 1909. 508 p. il.

The bulb book, by John Weathers. 1911. 471 p. il.

Fertilization of orchids by insects, by Charles Darwin. 1862.

Mushrooms, by G. G. Atkinson. 1911. 323 p. il.

Manual of the trees of North America, by C. S. Sargent. 1922. 910 p.

The climates of the continents, by W. G. Kendrew. 1922. 387 p.

The A B C of evolution, by J. McCabe. 1921. 124 p.

Impurities of agricultural seed, by S. T. Parkinson. 105 p. il.

Wild flowers of Western Canada, by W. C. McCalla. 1920. 132 p. il.

Cyclopedia of hardy fruits, by U. P. Hedrick. 1922. 370 p. il.

Introduction to the chemistry of radioactive substances, by A. S. Russell. 1922. 173 p. il.

Common British beetles and spiders and how to identify them. 1918. 62 p il.

Aids to bacteriology, by W. Partridge. 1922. 276 p.

Chemistry and its uses, by W. McPherson. 1922. 447 p. il.

Woodwork tools and how to use them, by W. Fairham. 214 p. il.

Modern manufacture of chemical manures. 1920. 85 p. il.

The American fertilizer handbook. 1922.

Surveying for settlers, by William Crosley. 1922. 159 p. il.

Progress report of the Manitoba agricultural survey.

Moody's manual of public utilities, 1922. 2480 p.

The vitamine doctrine and the oleomargarine industry, by W. D. Richardson. 1921. 16 p.

The food value of margarin or oleomargarine, by J. S. Abbott. 1921.

Bacteriology for nurses, by H. W. Carey. 1922. 149 p. il.

Autobiography of John Macoun. 1922. 303 p.

District school recitations, by C. B. Case. 1917. 156 p.

Building with India, by D. J. Fleming. 1922. 228 p. il.

Ox-team days on the Oregon trail, by Ezra Meeker. 1922. 225 p il.

Recent economic developments in Russia, by K. Leites. 1922. 239 p. il.

Second year book of the league of nations, by C. H. Levermore. 1922. 430 p.

First year book of the league of nations, by C. H. Levermore. 1921. 77 p.

Guide to the dissection and study of the cranial nerves and blood vessels of the horse, by G. S. Hopkins. 1922. 41 p. il.

A classified list of agrarian surveys in the public record office. 1922. 23 p.

The rural community, by L. MacGarr. 1922. 239 p.

The rural mind and social welfare, by E. R. Groves. 1922. 205 p.

Recreation in theory and practice, by P. L. Rohrer. 1922. 135 p.

Agriculture and the community, by J. F. Duncan. 1921. 119 p.

The evolution of people's banks, by D. S. Tucker. 1922. 272 p.

The co-operative societies of Japan. 1921. 34 p.

The romance of everifarm, by J. H. Sconce. 1922. 162 p. il.

The labour movement and the farmer, by H. Robbins. 1922. 195 p.

Report of the international statistical commission, by M. Lucien March. 1922. 35 p.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Dominion Experimental Farms.—Report of the Director for the year ending March 31, 1922.

Division of Field Husbandry, 1921.- Interim Report of the Dominion Field Husbandman, E. S. Hopkins, B.S.A., M.S., Dominion Experimental Farms.

Division of Horticulture, 1921.—Interim Report of the Dominion Horticulturist, W. T. Macoun, Dominion Experimental Farms.

Poultry Division, 1921.—Interim Report of the Dominion Poultry Husbandman, F. C. Elford. Dominion Experimental Farms.

Experimental Station, Cap Rouge, Que., 1921.—Interim Report of the Superintendent, Dr. G. A. Langelier. Dominion Experimental Farms.

Experimental Station, Lennoxville, Que., 1921.—Interim Report of the Superintendent, J. A. McClary. Dominion Experimental Farms.

Experimental Station, Summerland, B.C., 1921.—Report of the Superintendent, R. H. Helmer. Dominion Experimental Farms.

Experimental Station, Sidney, B.C., 1921.—Report of the Superintendent, E. M. Straight, B.S.A. Dominion Experimental Farms.

Experimental Station, Rosthern, Sask., 1921.—Report of the Superintendent, W. A. Munro, B.A., B.S.A. Dominion Experimental Farms.

Experimental Station, Lacombe, Alberta, 1921.—Interim Report of the Superintendent, F. H. Reed, B.S.A. Dominion Experimental Farms.

Experimental Station, Lethbridge, Alta., 1921.—Interim Report of the Superintendent, W. H. Fairfield, M.S.

Experimental Sub-Stations, 1921.—Beaverlodge, Alta., Fort Vermilion, Alta., Grouard, Alta., Fort Smith, N.W.T., Fort Resolution, N.W.T., Swede Creek, Yukon, Salmon Arm, B.C.—Interim Reports of the Experimentalists in Charge. Dominion Experimental Farms.

Finishing Steers for Market in North-Western Saskatchewan.—By M. J. Tinline, B.S.A., Superintendent, Experimental Station, Scott, Sask. Pamphlet No. 17—New Series.

Winter Steer Feeding in Manitoba.—By W. C. McKillican, B.S.A., Superintendent, Experimental Farm, Brandon, Man. Pamphlet No. 18—New Series.

The Winter Finishing of Steers in Western Quebec.—By J. A. McClary, Superintendent, Experimental Station, Lennoxville, Que., and M. D. McCharles, B.S.A., Assistant. Pamphlet No. 19—New Series.

The Winter Finishing of Steers in Western Nova Scotia.—By W. W. Baird, B.S.A., Superintendent, Experimental Farm, Nappan, N.S. Pamphlet No. 20—New Series.

The Winter Feeding of Beef Cattle in Ontario.—By Geo. W. Muir, B.S.A., and S. J. Chagnon, B.A., B.S.A., Division of Animal Husbandry. Pamphlet No. 21—New Series.

The Natural Control of the Fall Webworm (Hyphantria cunea Drury) in Canada.—With an account of its several parasites.—By John D. Tothill, D.Sc. in Charge of Natural Control Investigations, Entomological Branch Bulletin No. 3—New Series (Technical).

Directions for Collecting and Preserving Insects.—By J. H. McDunnough, Ph.D., Chief, Division of Systematic Entomology. Pamphlet No. 14—New Series.

Fox Ranching in Canada.—By J. A. Allen, B.V.Sc., Animal Pathologist, Fox Research Station, Charlottetown, P.E.I., and J. Ennis Smith, Biochemist, Research Station, Hull, P.Q. Bulletin No. 12—New Series.

Oat Hulls and Their Use in Feeding Stuffs.—By A. Eastham and L. V. Baker. Seed Branch. Circular No. 11.

ONTARIO

Agricultural Societies and Convention of the Association of Fairs and Exhibitions.—Twenty-second Annual Report, 1922.

The Cabbage Maggot.—By Lawson Caesar, Provincial Entomologist. Bulletin No. 289. Ontario Agricultural College.

The Rural Literary and Debating Society.—By G. H. Unwin, B.A., B.S.A., Associate Professor of English. Bulletin No. 290. Ontario Agricultural College.

QUEBEC

Quebec Society for the Protection of Plants.—Fourteenth Annual Report, 1921-1922. Supplement to the report of the Minister of Agriculture.

L'Elevage Du Lapin.—By J. E. Bélanger, Chief of Publications. Bulletin No. 47.

SASKATCHEWAN

Sixteenth Annual Report of the Dairy Commissioner for the twelve months ended April, 30, 1922.—With which is published as an appendix the Report of the Thirteenth Annual Convention of Saskatchewan Dairymen.

BRITISH COLUMBIA

Small Fruit Survey.—A Report on the Cost of Growing Strawberries and Red Raspberries in Certain Coast Sections of British Columbia during the season of 1921. By A. F. Barss, A.B., B.S. in Agr., M.S., Associate Professor of Horticulture, College of Agriculture, University of British Columbia. Agricultural Department Circular No. 39.

MISCELLANEOUS

Canadian Seed Growers' Association, 1921-22.—Report covering the Seventeenth and Eighteenth Years' Work.

Fur Farms, 1921.—Issued by the Dominion Bureau of Statistics, Fur Division.

Reindeer and Musk-Ox.—Report of the Royal Commission upon the possibilities of the Reindeer and Musk-Ox Industries in the Arctic and Sub-Arctic Regions. Issued by the Department of the Interior, Ottawa.

Irrigation Practice and Water Requirements for Crops in Alberta.—Irrigation Series Bulletin No. 6. Department of the Interior. By W. H. Snelson, A.M.E.I.C., Senior Irrigation Specialist.

Agricultural Loans.—Summary of Legislation Providing for Farm Loans and Rural Credits in the Provinces of Canada. Prepared under the direction of the Superintendent, Natural Resources Intelligence Branch, Department of the Interior.

The Canadian Ayrshire Herd Book.—Containing pedigrees 74401 to 78450. Volume XXXI. Compiled and edited in the office of the Canadian National Live Stock Records, Ottawa, 1921

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

GENERAL INFORMATION

1.—The Effect of a Variation in Milling on the Digestibility of Wheat Flours.—LANGWORTHY, C. F., and HOLMES, A. D., in *Proceedings of the National Academy of Sciences in the United States of America*, Vol. 7, No. 4, pp. 119-123 Washington, April, 1921.

The shortage in the World's food supply in 1917 made the collection and the correlation of data concerning human nutrition of the utmost importance and many questions were re-examined in the hope of providing additional data of value.

Extensive investigations into the chemical composition, digestibility and nutritive value of wheat and wheat products have already been made by the Office of Home Economics of the U.S Department of Agriculture undertaken with the co-operation of the Maine and Minnesota Agricultural Experiment Stations. They include studies in the digestibility of wheat flours prepared in a variety of milling conditions from wheat grown in similar climatic, seasonal and soil conditions. The results obtained showed that the protein of white flour (72% extraction) was 88.1% digested; that of entire wheat flour (85% extraction) was 81.9% digested and that of graham flour (100% extraction) was 76.9%.

In 1917, the U S Food Administration requested the Office of Home Economics to obtain additional data concerning the relative digestibility of flours representing a series of extractions from the same lot of wheat. The flours studied were prepared from the wheat mixture provided to the flour-millers by the U S Grain Corporation late in 1917 and consisted of the following choice hard spring (largely Marquis), 20%—: spring, 25%—velvet chaff, 15%—slightly smutty spring, 25%—durum, 10%—Kansas and Oklahoma, 5%. The milling rates adopted were: 54-70-85-100% of wheat, or in other words the flours were those known in commerce as "patent," "standard patent," "whole wheat" and "graham." The digestibility tests were conducted with healthy young men, of whom some were accustomed to much and others to comparatively little exercise. There were 139 of these tests and the experimental periods were from 15 to 25 days in length and subdivided and regarded as separate and successive three-day experiments. The diet consisted of bread, oranges, sugar with tea or coffee. The following table summarizes the results.

Summary of Experiments on the Digestibility of Wheat Flours

Kind of flour used	Number of Experiments	Amount of bread eaten per man per day	Digestibility of entire ration			Digestibility of bread protein	Digestibility of bread carbohydrate
			Protein	Fat	Carbohydrate		
		Grammes	Per cent	Per cent	Per cent	Per cent	Per cent
54% flour..	43	600	87 8	96·5	98·8	87 7	99 7
70% " ..	42	564	90·1	96·1	99 0	90 1	99 9
85% " ..	21	472	87·1	96·9	97·5	87 1	98·5
100% " .. .	33	663	84·2	93·9	95 0	84·2	94·4

Thus the maximum of digestibility was shown by the 70% flour, that of the 54% was slightly greater than that of the 85% flour, while the digestibility of the 100% flour was the lowest. The results are in accord with those obtained in earlier experiments. The fat content of the diet was equally well digested, digestibility being almost complete, except in the case of the 100% flour, when it reached 93.9% only.

The 54% and 70% flours did not tend to produce constipation; the 85% and 100% flours produced a somewhat freer movement of the bowels but no marked laxative effect was noticed.

50572—6

CROPS AND CULTIVATION

13. - Relation of Organic Matter and the Feeding Power of Plants to the Utilisation of Rock Phosphate.—BAUER, F. C., in *Soil Science*, Vol. XII, No. 1, pp. 21-39. bibliography of 45 works. Baltimore, M.D., July, 1921.

The processes accompanying the decomposition and the feeding power of plants are undoubtedly important factors in the utilisation of rock phosphate. Experiments were planned in which common forms of organic matter were used with rock phosphate and in some cases provision was made for the removal of the soluble phosphorus and calcium in order more nearly to imitate field conditions in this respect. The soil medium consisted of either sand or soil, the former contained no soluble phosphorous. Experiments were made as follows: (a) rock phosphate mixed with several forms of organic matter in sandy soil with no provision for the removal of phosphorus as it became soluble; (b) in similar mixtures provision was made by leaching and (c) by upward moving capillary water, both for the removal of phosphorus as it became soluble; (d) study of the solvent effect of organic matter extract with and without carbon dioxide on rock phosphate; (e) pot culture experiments, also made to ascertain this effect and to test the feeding power of plants in relation to the utilisation of rock phosphate and felspar. The results may be summarised as follows:

(1) Experiments a) (b) (c) and (d) failed to show a solvent effect of the decaying matter on rock phosphate, and in confirmation of results obtained by other investigators, there was evidently a gradual decrease in the amount of soluble phosphate. The failure of the experiments to show an increase in the availibility of rock phosphate was probably due to the fact that when organic matter such as was used (in this case finely pulverised air dry buckwheat hay, sweet clover hay, alfalfa hay, soybean hay, mammoth clover hay, maize stalks, oat straw and chopped green buckwheat and sweet clover) decomposes, sufficient bases are liberated along with the acids that are formed, to neutralise the acids and prevent their action on rock phosphate. When mixtures of rock phosphate and organic matter are applied to soils, the conditions are different because of the capacity of soils to take up basic material, especially if they are acid.

In some cases mixtures of organic matter and rock phosphate applied in pot cultures produced increase in growth of maize over that produced by either the organic matter or ock phosphate when used alone. The hosphorus in organic matter was readily available to growing maize. The organic matter furnished phosphorus to the seedling and thereby promoted growth which may have enabled the plant to feed more strongly on the rock phosphate, or the rock phosphate may have been made more available by the chemical and biological processes accompanying the decay of the organic matter.

A study of the growth of 15 different plants on rock phosphate in sand cultures showed a wide variation in the amount of dry matter produced. The crops tested were red clover, sweet clover, wheat, oats, maize, timothy, soy beans, rape, alfalfa, rye, buckwheat, red top, red sorrel, mammoth clover and alsike clover. Tables show the average yields of dry matter of the tops, roots and plants as a whole, the proportion of roots to the whole plant when grown with rock phosphate, and the percentage growth made with rock phosphate compared with that made with acid phosphate are recorded; also the phosphorous and calcium content of plant tops and acidity of leaves, stems, and roots of plants grown with acid cultures with no potash, soluble potash and felspar potash.

Results show that there was quite a wide variation in the growth of the different plants with rock phosphate used at the rate commonly advised for field practice. Sweet clover and red sorrel produced the largest proportionate increases in dry matter and red clover the smallest. The increases of the former were about 3½ times greater than the latter. Sweet clover possesses remarkable feeding powers relative to rock phosphate and felspar and is well suited to rotations for their utilisation. With the exception of sweet clover which gave a slight increase, all the plants analysed showed somewhat distinct decreases in the percentage content of phosphorus when grown on rock phosphate as compared with acid phosphate. In general, neither the percentage content, nor the total amount, of phosphorus in the plant tops were related to the amount of plant growth made with rock phosphate.

The acidity values of the juice of the leaves, stems and roots varied considerably with the different plants. In general the juices were more acid when grown with acid phosphate than with rock phosphate.

The possibility of growing crops of high feeding power to supply organic matter and available phosphorus in rotation with crops of low feeding power is a question of considerable practical importance in the utilisation of rock phosphate.

Decomposition of Green Manures at Different Stages of Growth.—MARTIN, T. L., *New York Agricultural Experiment Station*, Cornell, Bulletin 406, pp. 139-169. 1921.

Studies to determine the exact stage of growth at which crops used as green manures decompose most rapidly and exert their greatest influence on the soil as indicated by rate of humus formation, accumulation of nitrates and increased availability of plant nutrients in soil are reported. The soil used was Dunkirk clayey silt loam. Rye, oats and buckwheat were used as green manures, each crop being obtained at three different stages of growth.

The study consisted of a series of three experiments covering the period of three years. In the first series equal green weights of rye, oats and buckwheat were incorporated at three stages of maturity with separate soil samples and incubated for four months. In the third series nine areas of soil were sown to rye, oats and buckwheat, three areas being given to each crop. Green material representing the first, second and third stages of maturity for each crop was then successively obtained from the respective areas for incorporation with the soil to be studied. With increase in maturity there was a corresponding increase in the green and dry weights added to the soil, thus approximating field conditions.

It was found that the value of organic matter in the soil is dependent on the ease with which it decays. The greater the succulency of the crops used as green manures the more quickly do they decay. When crops are about half grown they are said to be at the point of maximum succulency. Soils receiving incorporations of green manures at the half mature stage produced the largest crop yields when subsequently cropped.

Increasing amounts of dry matter added to the soil in conjunction with increased maturity had the same general effect on the humus formation, the accumulation of nitrates and crop growth as did the addition of equal weights at each stage of increased maturity. The more rapid the decomposition of green manures the greater was the increase in the availability of plant nutrients in the soil as indicated by the greater crop yield. The younger the organic matter used the larger was the percentage of total nitrogen present therein.

The rate of nitrate accumulation was the greatest when green manures of maximum succulency were incorporated with the soil. It is thought that some of the nitrates formed in the soil by the influence of green manure are probably utilized by growing organisms. It was found that nitrates do not accumulate in the soil until the green manures have become considerably decomposed. The longer the period during which green manures were allowed to humify in the soil the less was the amount of humus found in the soil on analysis.

There are considered to be three periods in the humification of organic matter. In the first period humus alone is formed, thus allowing an accumulation in the soil. During the second period humic decomposition sets in and the humus is reduced as rapidly as it is formed, resulting in no further accumulation. In the third period humus formation ceases and the only process is humus decomposition, resulting in a rapid decrease in the amount in the soil.

Under the same conditions rye and oats were found to decay at approximately the same rate, buckwheat, particularly in the maturer stages, decayed much more readily than rye or oats of corresponding maturity.

It is concluded that the greatest rapidity of decomposition and the greatest benefit to the soil are achieved by the use of these green manures at the half grown stage.

A Comparative Study of the Value of Nitrate of Soda, Leguminous Green Manures and Stable Manure. LIPMAN, J. G. and BLAIR, A. W., in *Journal of Agricultural Science*, Cambridge, England, Vol. 11, No. 3, pp. 325-336. Cambridge, England, 1921.

In a contribution from the New Jersey Experiment Station comparative studies by means of cylinder experiments covering a period of 13 years of the nitrogen of sodium nitrate, stable manure and leguminous green manure crops on eight soil types are reported.

Three hundred and twenty cylinders were used, making it possible to run a 5-year rotation on the eight types of soil with five different treatments for each type. The treatments included series 1, no fertilizer; series 2, mineral fertilizer only; series 3, mineral fertilizers and stable manure. All cylinders received liberal applications of ground limestone every five years. The rotation consisted of rye, ... corn, potatoes and oats, all grown every year in the eight soils.

Under all the treatments the largest crops were obtained during the first two or three years of the period. From the point of maximum yield, which in most cases occurred within the first three years, there was a gradual decline in yields, both of total dry matter and total nitrogen. This decline however was not without some exceptions. Without exception the average yields for the 13 years were less than the average for the first seven years. Of the eight types of soil used, Quinton sandy loam consistently gave the largest crops and the largest nitrogen return, followed closely by Penn loam. Norfolk sand likewise consistently gave the lowest returns. Windsor sand showed a remarkable response to the green manure treatment.

Of the five different treatments the green manure series gave the highest average returns on all the soils, although in a few cases scattered through the 13 years and for the majority of the soil types during the

first two years, the sodium nitrate series gave the largest yield. In a very few cases the yield on the stable manure series exceeded that of the green manure series. The average yield of the nitrate series stood between the green manure and stable manure series.

These results are taken to indicate that for a period of 13 years nitrogen supplied by leguminous green manure crops, grown between the main crops of the rotation, was more effective in crop production than 15 tons of manure every two years, while at the same time the nitrogen content of the soil of the green manure series was maintained for a period of five years at least on a level with that of the stable manure series.

It was also shown that the green manure series yielded larger crops than the sodium nitrate series and at the same time maintained the nitrogen content of the soils at a higher level. It is pointed out that it may be possible to maintain crop yields at a rather high level even when the total nitrogen content of the soil is not kept at quite so high a level as was found in the original soil. Under such conditions, however, a constant turnover of readily available nitrogen is necessary.

14.—The Effect of Basic Slag upon Grassland and the Subsequent Crops.– OLDERSHAW, A. W., in the *Journal of Agricultural Science*, Vol. XI. Pt. 3, pp 288-292. Cambridge, July, 1921.

Two plots of grass land, each 1¾ acres in extent, on a poor type of chalky boulder clay, were fenced off with wire netting; one was reserved for control purposes, and the other received a dressing of 10 cwt. per acre of basic slag, and a second dressing of a similar nature 8 years later. After 12 years of regular sheep grazing, on analysis of the first and second 9 inches of soil, the basic slag plot was found to contain 500 lb. of nitrogen per acre more than the unmanured plot.

The following year, the plots were mown, ploughed up, and drained and sown with legumes and wheat successively, with dressings of superphosphate and sulphate of ammonia. The turf on the "Slag" plot was very thick ,and the yield was fairly high probably due to the thick growth of wild white clover. The increase in nitrogen as compared with the unmanured plot is only about 10% whilst the increase in crop is much larger. It appears likely that the nitrogen assimilated being of more recent origin, would be more easily available to plants than the original nitrogen reserves of the soil. It is likely also that the extra plant residues left on the slagged plot, have a considerable influence on the mechanical condition of the soil and its humus content. It is well known that the presence of phosphate in heavy soils causes increased root development, but whether this applies also to slagged plots and the actual fate of the phosphates in this case, are points which still require investigations.

1201.—Measuring Soil Toxicity, Acidity and Basicity.—CARR, R. H. in *The Journal of Industrial and Engineering Chemistry*, Vol. XIII. No. 10. pp. 931-933. New York, October 1, 1921.

It is well known that a very acid condition of the soil is unfavourable to the growth and development of many plants. The cause of this poor growth has been attributed to lack of available calcium and magnesium, to the presence of toxic salt of aluminium and iron and to the presence of free acid (H -ion concentration). The fact that aluminium salts are toxic has been reported by many workers. The extent to which iron is toxic when associated with aluminium in acid soils is not so well understood, but the author believes, that the conditions making it soluble enough to be toxic occur infrequently.

The author has made a study of soil composition and toxicity as related to the root rots of maize, and has attempted to develop a method for determining soil acidity based upon the fact that in the absence of calcium, magnesium or other bases in the soil, the aluminium and iron salts can act as bases to form soluble salts. It was noted by Comber (*Journal of Agricultural Science* X, 420, 1920), that when an alcoholic solution of potassium thiocyanate was shaken up with an acid soil, a red colour developed, more or less in proportion to the acidity of the soil. This red colour was due to the formation of ferric thiocyanate from soluble ferric iron in the acid soil. The presence of aluminium in the alcoholic solution can readily be shown by the addition of a few drops of an alcoholic solution of logwood which produces a blue colour somewhat in proportion to the amount of aluminium.

If 50 gm. of 10-mesh soil are treated with 30 cc. of a saturated solution of potassium thiocyanate in 95% alcohol and shaken for two minutes, the liquid will become pink or red if the soil is acid. On adding from a burette a 0·10 N. alcoholic solution of potassium hydroxide until the colour disappears (at which moment a change takes place at H–ion concentration of PH = 5·5) the amount of lime required by the soil is obtained. Each cubic centimetre of 0·10 N base is equivalent to 200 lb. of calcium carbonate per acre. If no red colour develops, the soil is basic, and by adding from a burette a 0·10 N alcoholic solution of hydrochloric acid, the calcium carbonate equivalent of the soil may be determined.

The author tried this method on 20 soils and determined the calcium carbonate recovered after some pot culture experiments.

Hence it appears, that the method suggested lends itself to the determination of either the acid or basic condition of a soil, as well as of the soluble aluminium and iron present.

60.—The Forests of the United States as a Source of Liquid Fuel Supply.—HAWLEY, R. C., in *The Journal of Industrial and Engineering Chemistry*, Vol. XIII, No. 11, pp. 1059-1060. New York City, November, 1 1921.

The purpose of this paper is to present a concise statement showing the amount of wood available for conversion into liquid fuel which can be produced annually on the forest lands of the United States (Alaska and insular possessions excluded).

The forest area of the United States is as follows: -

Area and growth of the forests in the United States

Area forested Acres		Present growth Cub Ft.	Possible growth Cub. Ft.
245,000,000	Second growth	5,995,000 000	14,700,000,000
81,000,000	Forest waste land on which nothing can grow without reafforestation	Nil	4,860,000,000
137,000,000	Virgin Forests	Nil	8,220,000,000
463,000,000		5,995,000,000	27,780,000,000

To-day the annual growth of wood is approximately six billion cubic feet. The possible growth, provided the lands are properly restocked after cutting, and protected, is conservatively estimated at twenty-seven and three quarters billion cubic feet per year. Not all of this annual growth would be available for manufacture into liquid fuel, as provision must be made for lumber and numerous other forest products.

Each year approximately twenty-six billion cubic feet of wood (far in excess of the present growth and taken principally from the accumulation of virgin timber) are removed from the forests, distributed as shown in the following table.

Amount of wood removed annually from the forests of the United States

Cut	Equivalent in standing timber Cub Ft
Lumber	8,913,300,000
Fuelwood	10,450,000,000
Other products	4,955,000,000
Destroyed by fire, insects and fungi	1,739,000,000
Total	26,048,915,000

Out of this total cut, at least 4,800,000,000 cubic feet of the lumber are lost through waste in the woods and at the mills. Adding to this the 1,730,000,000 cubic feet destroyed by fire, insects and fungi gives a total of 6,530,000,000 cubic feet of wood annually wasted which would be available for liquid fuel, without encroaching upon the supply needed for other purposes. Furthermore, the possible annual growth (27,750,000,000 cubic feet) exceeds the annual requirements (26,000,000,000 cubic feet) by 1,750,000,000 cubic feet, furnishing an additional 1,750,000,000 cubic feet for liquid fuel. Finally, the increased growth which will follow intensive forest crop management, particularly the removal of small wood in thinnings, should amount to not less than 10 per cent of the possible growth, or 2,750,000,000 cubic feet. This gives a total of 11,000,000,000 cubic feet, as summarised below.

Estimate of amount of wood for liquid fuel which could be secured from forests of the United States without encroachment upon supply of other Forest Products

----	---	Cubic Feet
Waste in the wood and at the mills		4,800,000,000
Losses from fire, insects and fungi	Taken out in thinnings	1,730,000,000
Excess of possible growth over annual cut	Taken out in thinnings	1,750,000,000
Increased growth due to more intensive crop management.	Taken out in thinnings	2,750,000,000
Total		11,030,000,000

In making a calculation of how much liquid fuel this 11 billion cubic feet of wood will produce, a cubic foot of wood is taken as weighing 30 lb. and a ton of wood as yielding 15 gallons of alcohol. On this basis the 11,000,000,000 cubic feet of wood will furnish an annual output of 2,475,000,000 gallons of alcohol or 33 per cent the total amount of alcohol needed to replace the present output of gasoline.

The cost of the raw wood laid down at the manufacturing plant is estimated to average 25 cents per gallon of alcohol produced by present methods, although where the proper region and species are chosen this figure may be reduced to 7 cents a gallon. It remains for the chemists to develop improved methods for utilizing the cellulose more completely, thereby increasing the output of liquid fuel secured from a ton of wood.

Professional foresters may be expected to co-operate fully with the chemists in their efforts to utilize wood as liquid fuel for at least two reasons: firstly, because utilization of waste in the woods and at the mills clears the forest of material now unsalable which is often a dangerous fire and insect risk, and secondly, because the opportunity to dispose of small trees in thinnings will make more intensive forestry possible, and this in turn will increase the quality and quantity of forest crop production.

It is realised that the utilization of wood as liquid fuel on a large scale is not likely to come for a decade or more. In order to have available when needed the largest possible annual supplies of wood, forested areas must without delay be protected, scientifically cut, and completely restocked. For this reason the author asks for the support of the American Chemical Society in providing for the more satisfactory control of the nation's forest resources.

LIVE STOCK AND BREEDING

61.—International Conference for Defence against Epizootic Diseases Paris May-June 1921.—Masse, A., in *Comptes rendus des séances de l'Academie de l'Agriculture de France* (Meeting of June 1, 1921), Vol. VII, No. 21, pp. 481-487. Paris, June, 1921.

At this International Conference all the States of Europe were represented as well as a large number of the States of North and South America, Asia and Australia.

The conclusions arrived at may be summarised under 3 heads:

(1) As regards rinderpest, it was decided that as soon as this disease makes its appearance in the territory of any State, it is the duty of the neighbouring States to close their frontiers not only to cattle, but at the same time to other species of animals which not being susceptible to the disease, are not generally regarded as likely to spread it.

Owing to differences of opinion regarding the pig as a carrier of disease germs, the Conference was of opinion, that the scientists of the different countries should be requested to direct their investigations to the danger of infection caused by the transport of certain animals, or even of some animal products, including frozen meat. The Delegate of Poland drew the attention of the Conference to the fact that to require the destruction of all animals suffering from rinderpest (a disease very generally prevalent to a greater or less degree) would entail the complete destruction of stock, and the Conference in the light of this objection limited itself to passing a resolution recommending the various Governments to enforce the destruction of animals attacked by rinderpest.

It was next laid down that the first duty of infected countries towards their neighbours was to warn the latter immediately of the presence of serious diseases and to keep the neighbouring States informed of the minutest details connected with the course of the malady.

(2) The second question dealt with the measures that should be taken by the States to guarantee that all stock imported into other countries is perfectly healthy and free from any suspicion of infection. The Conference decided that a period of quarantine before shipping would best serve the purpose. It also considered it highly desirable that the States should agree upon an identical form of certificate, giving guarantees of equal value from whatever country the stock was imported.

(3) Thirdly the Conference decided to establish a permanent Bureau at Paris for the purpose of studying the measures to be adopted against epizootic disease, and of publishing an international Bulletin containing precise information respecting the sanitary condition of each country as regards rinderpest, foot-and-mouth disease, contagious peripneumonia, anthrax, sheep-scab, rabies, glanders, dourine and swine-fever, as well as reports of the researches carried on in the different laboratories.

1254.—Comparative Value of Root Ration and Silage for Dairy Cows, Experiments in England.—Oldershaw, A. W., and Smith, F C., in *The Journal of the Ministry of Agriculture,* Vol. XXVIII, No. 7, pp. 614-621. London, Oct., 1921.

In previous experiments it was found that a ration of 60 lb. of silage was equivalent to 60 lb. of mangolds and 7 lb. of straw chaff. There was very little difference in the amount of milk given by cows fed on the two rations.

Since then it has been claimed that owing to the fact that silage contains considerably more albuminoids than roots, it should be possible to reduce the quantity of expensive concentrated food fed when silage is being used.

Experiments were carried out in the Eastern Counties of England, where the system of ensilage has made great progress during recent years.

It appears from the results obtained that 60 lb. of oat and tare silage plus 10 lb. barley straw chaff plus 14 lb. kale (Marrow stem) plus 4 lb. mixed concentrated foods (equal weights of decorticated cotton cake and dried grains) give about ⅛ of a gallon of milk per cow less than 60 lb. of mangolds fed with the same quantity of barley straw and kale, but double the amount of concentrated foods. That is to say, 60 lb. of silage is not equal in milk producing capacity to 60 lb. of mangolds plus 4 lb. of concentrated foods.

However, as regards the cost of the silage ration in the production of milk, this was ¾ d. per gallon less than that of the root ration.

89.—Shortening the Incubation Period by Exposing Eggs to Radium Emanation.—Experiments made in Austria.—WIENINGER, E. G., in *Wiener Landwirtschaftliche Zeitung*, Year LXXI, Nos. 92-93, pp. 464-465. Vienna, November 19, 1921.

A communication made by the author to the World Congress of Aviculture held at the Hague in September, 1921. It gives the results of his five-years' researches undertaken to determine the effect exercised by a radium emanation upon incubation: (1) in an incubator with a constant supply of hot water; (2) in an incubator heated with hot air; (3) under a broody hen.

The hygroscopicity of the air in the incubators being 55% to 65%, the temperature varied from 38·3° C to 40·6° C.

In order to expose the eggs to the emanation, the bromide of radium enclosed in ebony boxes 2 cm. in diameter and covered with a thin sheet of mica, was introduced into the apparatus, 20 cm. above the eggs.

The experiments proved that the duration of the emanation and the amount of radium employed had no bad effect upon the hatching out of the chicks.

Of the artificially incubated eggs 95·2% hatched, which is remarkable considering that the experiment was carried out from November to January which is, as a rule, a bad season for the fertilization of eggs. Further, the incubation period was shortened by 4 to 6 days.

The chickens from the eggs exposed to the emanation were unusually strong and grew very fast; at the end of six weeks, they had attained twice the size of the control birds.

The pullets began to lay after the 5th month and continued producing eggs almost without interruption from August to February.

As there is no difficulty of technique to be overcome, and only a question of obtaining the necessary amount of bromide of radium (50 to 100 mg.) the author is of opinion that the process he describes could well be carried out, in future, in practical chicken incubation.

1263.—Capons Versus Cockerels for the Market in the United States.—WAITE, R. H., in *The Maryland State College of Agriculture, Agricultural Experiment Station, Bulletin* No. 235, pp. 119-131, bibliography of 17 works. College Park, Md., March, 1920.

With a view to obtaining definite figures showing the relative size and rate of growth of capons and cockerels, the author carried out experiments in 1919, at the Maryland Agricultural Experiment Station. Forty-two White Plymouth Rock cockerels, all hatched on May 28 in the same incubator, were divided into two groups as nearly equal as possible, as regard health and vigor. On May 30, one of the groups were caponized. The two groups were kept entirely separate, and their gain in weight and the food they consumed were recorded.

Until October 1, both groups had access to poultry yards measuring 15 ft. x 125 ft. and after that date, they were confined to open-front houses 15 ft. x 15 ft. in size.

Until January 16, the following dry mash was fed to both groups *ad libitum*: bran 100 lb.—wheat middlings 100 lb.—beef scrap 30 lb.—bone meal 5 lb.—salt 1 lb. A mixture of white maize and wheat was also given as a scratch feed. From January 17, the following fattening ration was fed: Maize meal 100 lb.—wheat middlings 50 lb—beef scrap 20 lb.—lucerne meal 30 lb.—salt 1 lb.—and in addition, wheat and yellow maize were given twice daily.

From May 28, 1919 to February 7, 1920, the average feed eaten (mash + grain), by the capons and cockerels respectively was 63·28 lb. and 62·00 lb. and the gains made were 6·66 lb. and 5·66 lb.

It was found that during the second period (January 17 to February 7), a less amount of food was required. The author suggests that this may probably be due to the vitamines which are said to be present in lucerne. Another possible explanation may be found in the higher vitamine content of yellow maize as compared with that of the white varieties.

A table giving the money gain or loss shows that at the present market price (average for period May 28, 1919 to February 7, 1920: 4·02 dollars for capon weighing on an average 7·76 lb.), it does not pay to grow

50572—7½

these birds if yarded and all the feed purchased, for present prices only just cover the cost of rearing A fair profit can, however, be reasonably expected, if they are reared on a farm where they can range at will and pick up a fair proportion of their food, the balance of the ration being made by grain of inferior quality, and feed. In dressing, capons lost 6% of their weight. The live cockerels lost about 2·6% of their weight during transport.

AGRICULTURAL INDUSTRIES

1285.—Comparison of Fat Test in Milk as Determined by a Cow-Testing Association and by a Creamery.—TROY, H. C., in *Cornell University, Agricultural Experiment Station, Bulletin* No. 400, 66 pp. bibliography of 12 works. Ithaca, New York, January, 1920.

Of recent years, the practice of selling milk wholesale on a weight and fat-percentage basis has become general throughout the State of New York. The members of cow-testing associations usually compare the fat-percentage found by the association tester with the percentage found by the purchaser. Both the tester and purchaser generally determine the fat content by the Babcock method, but use a different method for obtaining the test sample and the average fat percentage for each month.

Variations in the fat-percentages determined by the two tests frequently occur, as can be seen on comparing the herd record books of cow-testing Associations with the creamery records.

The author compared the milk and fat-percentage records of 22 herds as found by a cow-testing association with similar records obtained at the creamery belonging to the College of Agriculture of Cornell University, in the hope that by showing the range and frequency of variations between the results of the two tests, a source of dissatisfaction might be removed.

The records of the testing association showed that when the fat-percentage of milk was determined once a month in two successive milkings, it frequently varied more than 0·5% and sometimes more than 1% from the results of the preceeding monthly test.

The fat percentage variations found in the herd milk by the association tester were similar to those found in the milk of individual cows, but the range of variation in herd milk was narrower.

The average fat percentage in the milk given by a herd at two successive milkings as found by the association tester, ranged usually from 0·2 to 0·3% above or below the fat percentage for the month as found by the creamery.

In herd milk, differences of over 0·5% were not uncommon between the monthly fat percentage as found by the association test, and the creamery test respectively.

The differences between the fat percentages found by the two tests were less than 0·1 in 59·375% of the 32 complete annual records; they were between 0·1 and 0·2% in 31·25% of the records, and were greater than 0·2% in 9·375% of the records.

When all the milk produced during a year by a herd in a testing association is delivered to a creamery and the average difference between the association test and the creamery test exceeds 0·1% of fat for the year, an effort should be made to determine the cause of the difference.

Some of the milk tested by the association is used on the farms and if precautions are not taken to have the fat percentage of this milk the same as that of the milk delivered to the creamery, frequent variations in association and the creamery tests may result.

These two tests agree fairly well in recording fat percentage changes due to an advance in the period of lactation where the record covers a production period of several months, but the daily fluctuations of the fat percentage in herd milk, and the association method of accepting the fat percentage in two successive milkings as the average for the month, do not insure a close agreement between the two tests for monthly periods.

The association practice of testing monthly throughout the year, two successive milkings of each cow in a herd, permits a fair estimate to be made of the fat content of the milk produced by the herd during the year.

1289.—Causes and the Preventive Treatment of "Buttons" in Sweetened Condensed Milk.—ROGERS, L. A., DAHLBERG, A. O., and EVANS, A. C., in *The Journal of Dairy Science*, Vol. III, No. 2, pp. 122-129, 2 tables separate from the text. Baltimore, March, 1920.

The authors give the results of observations made at the Laboratory of the Dairy Division of the United States Department of Agriculture on the subject of the hard, brownish-red masses of coagulum found in sweetened condensed milk and known in commerce by the name of "buttons."

They are usually the result of enzymes produced by *Aspergillus repens*, but may also be caused by other moulds. It is probable that the milk becomes contaminated after leaving the condenser.

An effective method of preventing the formation of "buttons" is to seal up the tins under a low pressure (508 mm.), for moulds develop only when they have a good supply of oxygen at their disposal.

1290.—" Mottles " in Butter, their Causes and Prevention.—HUNZIKER, O. G., and HOSMAN, D. F., *Journal of Dairy Science*,

Vol. III, No. 2, pp. 77-106. Baltimore, March, 1920.

Butter instead of being of a uniform colour, is sometimes traversed by waves or streaks of different shades, or covered with patches. In the latter case, when deep-yellow translucent blotches interspersed with whitish opaque spots make their appearance, the butter is said to be "mottled."

Although mottles in butter have no effect upon its flavour, keeping quality and wholesomeness, they greatly depreciate its market value.

The authors give a summary of the previous investigations made for the purpose of discovering the causes of this defect, and afterwards describe their own experiments which consisted in: churning at different rates, stopping churning in all cases when the granules of butter had attained the size of wheat grains; washing or not washing the butter, salting it or not salting it; examining under the microscope the product obtained.

It was found that mottles appear in salted butter in which the working has been incomplete or lacking in uniformity. In mottled butter, the deep-yellow patches contain relatively few and rather larger water droplets, while the white patches contain large numbers of very minute droplets. The authors conclude that salt disturbs the emulsion of water-in-fat in butter, and that the uniformity of the emulsion can be restored by the proper working of the butter.

In order to prevent mottling, butter must be worked sufficiently to accomplish the fusion and re-emulsification of the water and brine. This point is usually reached when the butter has been reduced by working into a thick plastic and tough consistency. The working must be uniform throughout the churning; therefore sufficient workers should be employed to deal with the amount of butter to be made.

1291.—Casein Industry and Production in Denmark.—*Journal de la Société Nationale des Agriculteurs de Belgique*, Year III, No. 40, pp. 315-316. Brussels, Oct., 1921.

The casein industry in Denmark came into being during the winter of 1909 and the spring of 1910. At that time, the conditions of the Argentine market had caused a great rise in the price of casein, and the price of Danish cheese was so low, that the dairies in Denmark suffered heavy loss. The industrial manufacture of casein seemed to offer an excellent solution of the problem arising out of the crisis, as by this means, the large superfluous quantities of skim milk thrown on the market by the collapse of the local cheese trade could be turned to good account.

Owing to the various ways in which casein is used, the product found a ready sale in many directions and for a certain time its price rose. The importance of the industry grew rapidly and before the War, the output exceeded 2 million kg. The manufacturing process is methodical and scientific.

The quality of the casein is good, but is still somewhat inferior to the French product which is considered the best in the world. The Danish manufacturers however have every hope of attaining this standard of excellence. It is thought that the casein industry will regulate the price of Danish cheese on the market. As no local cheeses are exported if the prices are low, more casein is then made and the price of cheese is raised and *vice versa*. The work is distributed as follows: the dairies (" Mejerier ") make the great mass of curd (" Ostemasse ") and the casein is obtained from the " Ostemasse " at the drying-houses (" Torrerier "). Some dairies however have their own drying plant.

In Denmark, several methods are used in the drying process.

(1) " Skabsystemet " or closed cupboard method;

(2) " Kanalsystemet " or conduit method (adopted in France);

(3) " Forestner par Bakken Systemet " in which small desiccators on troughs are employed.

There are now 15 casein factories of which the chief are at Rudjobing, Kjerteminde, Aarhus, Jylland, Logstor and Hjorring.

Nearly all the casein made in Denmark is exported, most of it going to Hamburg, New York and Boston, either by way of Copenhagen or Aarhus.

Danish and Swedish casein is " Maelkesyre Kasein " or lactic acid casein, a much prized article of commerce outside Denmark, being used in the manufacture of paper, gelatine, and galalith, and also as an article of food. There is, however, some idea of starting a factory in Jutland for the industrial treatment of casein.

Casein is sold by sample, in sacks containing 50, 75 or 100 kg.

PLANT DISEASES

105. A Transmissible Mosaic Disease of Lettuce in the United States, Especially in Florida.—JAGGER, I. C., in *Journal of Agricultural Research*, Vol. XX, No. 10, pp. 737-740, Pl. 1. Washington, D.C., Feb., 1921.

In January, 1920, Roman lettuce (variety Paris White Cos) in a field at Sanford (Florida) was noticed to be attacked by a transmissible mosaic disease, showing a yellowish discoloration along the smaller veins of the younger expanding leaves. This symptom was usually evident for a few days only, followed by a general yellowish appearance of the whole plant. All gradations of discolorations occurred, from very marked, to

conditions hardly to be distinguished from normal. Close examination usually revealed irregular blotches of a comparatively normal green colour, generally located along the larger leaf veins. The blotching varied from a few green patches barely perceptible on a yellowish leaf to numerous pronounced green spots giving a marked mottled appearance to occasional plants. The leaves of diseased plants generally semmed to be rather more wrinkled than those of normal plants. Where plants became diseased only after reaching a considerable size, the older leaves, which were fully expanded on the first appearance of the symptoms, frequently continued to appear perfectly normal, while all the younger leaves developed disease symptoms. At the same time the head lettuce (variety Big Boston) in a neighbouring field, developed a similar diseased condition. The general yellowish appearance of the whole plants was frequently pronounced, but in most cases the blotching was less marked than in the Roman lettuce, and a decided mottled appearance was never observed.

In general, diseased plants were stunted. In severe cases, the plants were decidedly undersized, and occasionally the leaves formed only a rosette. Usually loose heads of poor quality were formed, although all gradations of development, including occasional heads of normal size and hardness occurred. Often plants that showed marked discoloration, mottling and stunting soon after becoming diseased, seemed partially to recover later and to make a more or less normal growth with only slight discoloration and mottling.

1300.—Diseases of the Douglas Fir (Pseudotsuga Douglasi) in Scotland.—WILSON, M., in *Transactions of the Royal Scottish Arboricultural Society*, Vol. XXXV, Pt. 1, pp. 77-78. Edinburgh, Sept., 1921.

Since the recent publication of the paper on *Phomopsis Pseudotsugae* observed on *Pseudotsuga Douglasii*, the author's attention has been drawn to a parasite, notified twice previously in Scotland, in Ayrshire (1896-1898), and Aberdeenshire (1911). Although identified as *Phoma pithya* Sacc. this parasite of the fir, being given the symptoms associated with its appearance, corresponds most probably in the author's opinion to *Phom. Pseudotsugae*. It may therefore be concluded that *Phom. Pseudotsugae* has been in existence in Scotland for a considerable number of years. Judging from the small number of records, however, it appears that at first the disease was not widespread. In fact it is only within the last ten or twelve years that its occurence in various localities was notified. There is little doubt that the actual damage done by the parasite has increased recently and that this cannot be altogether due to the increased area now under *Ps. Douglasii*. This view has received confirmation by the discovery of *Phom. Pseudotsugae* in various localities in England.

Botrytis Douglasii recorded several years ago in Scotland on *Ps. Douglasii* is widespread. This disease is also described as common in England.

112.—Copper, The Active Principle in Sprays.—FONZES-DIACON, in *Le Progrès Agricole et Viticole*, Year XXXVIII, No. 52, pp. 611-612. Montpellier, December 25, 1921.

Villedieu believed that his laboratory experiments with basic copper mixtures furnished sufficient proof of the non-toxic action of the copper, and therefore concluded that the anticryptogamic effect of these compounds must be due solely to the basic character of the sodium.

He therefore advised that the usual mixtures should be replaced by a compound containing a large amount of lime, and hence very basic, in which the secondary part of fixative on the vine shoots should not be sulphate of copper, an expensive foreign product, but sulphate of aluminium which can easily be supplied at lower cost by French industry.

Villedieu now fully recognizes the complete failure of his formula which was tested by experiments carried out in vineyards in various districts of France, but in his recent communication to the Academie des Sciences he is still of opinion that the efficacy of alkaline cupric mixtures in the control of "mildew" is to be attributed to their basic character, and not to the action of the copper compounds.

The author considered that the toxic effect of the copper in these sprays was clearly demonstrated by Manceau's comparative experiments with alkaline Bordeaux mixture and Villedieu's mixture. From these trials made in the open vineyard, Manceau draws the following conclusions. "Although the 1921 outbreak of 'mildew' was not severe, Villedieu's mixture proved of little use but the application of Bordeaux mixture kept the leaves healthy and insured a vigorous growth."

A convincing proof was obtained in the course of these experiments by adding 100 gm. of copper sulphate to a Villedieu mixture containing 5 kg. of lime, for the anticryptogamic action of the compound was found to persist throughout the whole vegetative period.

It is necessary, in order to realise the full significance of this experiment, to explain that the addition of so small a proportion of copper sulphate in no way altered the basic character of the mixture.

In fact, a little of the excess lime went to form a sulphate, thus setting free an equivalent amount of copper hydrate of the same

basicity, and yet although the caustic property of the mixture was lessened, since copper hydrate is much less soluble than lime, it was still efficacious against "mildew."

Thus, by the addition of a little copper sulphate, which was not sufficient to alter the basic character of the mixture, the vanished anticryptogamic action re-appeared; is it due to the basic function that has not been changed, or the copper? The author thinks there remains no shadow of doubt that copper compounds actually possess the efficacy against "mildew" that has been attributed to them as a result of long practical experience.

113.—**Experiments in the Use of Salts of Mercury in the Anticryptogamic Treatment of Seeds.**—GABEL, W., in *Zeitschrift fur angewandte Chemie*, Year XXXIV, No. 94, pp. 587-588. Leipzig, November 25, 1921.

In the anticryptogamic treatment of seeds, use has hitherto been made either of the mineral salts of mercury (usually corrosive sublimate), or of complex organic mercurial compounds Whereas in the presence of sodium or of ammonium sulphide, the mineral salts liberate mercury, the complex organic mercurial compounds are not acted upon at all, or else only to a very slight extent by these two salts, they also differ from bichloride of mercury in giving no precipitate with albuminoids so that they have no corrosive effect upon the seed, nor do they hinder its growth, while according to some accounts, they seem to have a good effect upon the yield.

The simplest organic compound of mercury is the cyanide; it is more efficacious in conferring immunity than the more complex compounds. By its use, the development of *Helminthosporium gramineum* can be prevented, a result never attained with the sublimate. The mineral salts of mercury, especially the sublimate, were introduced into practical agriculture by Hiltner in 1906, and used combined with copper sulphate under the name of "fusariol" for the treatment of seeds. Hiltner and his fellow-workers also tried to use various other mineral preparations of mercury. The employment of complex mercuric salts is of more recent date; they were first introduced in 1913 by Richem, while Remy adopted chlorophenolate of mercury for cereals attacked by *Fusarium* spp; this compound is the essential ingredient in "Uspulun." Another complex organic mercurial salt, cyanomercuricresolate of sodium, is present in "germisan" a very active but slightly poisonous anticryptogamic remedy; another substance employed in treating seeds is called "fusafine." It contains 20% of corrosive sublimate, kitchen salt, sodium sulphate, and an azoic colouring matter.

INJURIOUS INSECTS

125.—**Drosophila Rubrostriata and Phora Chlorogastra Diptera Recorded as Parasites of the White Cabbage Butterfly (Pieris Brassicae) in France.**—BONNAMOUR, S., in *Bulletin de la Société entomologique de France*, No. 15, pp. 217-219. Paris, 1921.

During the summer of 1921, a small field of cabbages at Saint-Genis-Laval, in the neighbourhood of Lyons, was destroyed by a large number of the caterpillars of the White Cabbage Butterfly (*Pieris brassicae*).

From these caterpillars were reared numerous specimens of *Apanteles glomeratus*, and of the tachinid *Compsilura concinnata*, as well as a fair number of small Diptera. Among the latter Villeneuve recognized *Drosophila rubrostriata* Beck, and one individual of *Phora chlorogastra* Beck.

D. rubrostriata was first recorded in the Canaries, and was carried to the Pasteur Institute by bananas imported from those islands to serve as food for the monkeys kept at the Institute. It is also found in tropical Africa.

The representatives of the family *Drosophila* live on decomposing organic matter of either animal or plant origin. Their parasitism on the caterpillars had not before been recorded. The observations so far made seem to show that *D. rubrostriata* is able, no doubt by simply depositing its eggs, to bring about the decomposition and liquifaction of the Cabbage Butterfly caterpillar, while on the other hand *C. concinnata* causes it to dry up.

Ph. chlorogastra is a rare southern species reported from Ragusa, it appears to have become acclimatised like *D. rubrostriata* in the Lyons district. The fact that these two Diptera are parasites of *P. brassicae* was however hitherto quite unknown.

127.—**Economy in Hydrocyanic Fumigation.** -SCHIERHOLZ, C., in *Oesterreichische Chemiker-Zeitung*, Year XXIV, No. 22, p. 166. Vienna, November 15, 1921.

When hydrocyanic fumigation is carried out at low temperatures, only from 80–84% of the hydrocyanic acid is liberated in 3 or 4 hours, the rest, 16–20% remaining in solution. Thus, in a warehouse (mill), of which the cubic content is 33,000 cubic metres, in order to obtain a concentration of one per cent in volume of hydrocyanic acid 330 cubic metres would be needed and calculating the amount remaining in solution, 200 kg. of cyanide of sodium, or 270 kg. of cyanide of potassium, would be required; this means 800 gm. of the latter salt per 100 cubic metres of empty space. The present prices of cyanides make it worth while trying to find some way of reducing

the amount used. It must be remembered in this connection, that the toxic action of hydrocyanic acid like that of carbon monoxide, is due to its asphyxiating property, and that the chief antidotes are oxygen and permanganate. For this reason, an attempt was made to decrease the oxygen content of the air either by using a solution of pyrogallic acid, or by burning vegetable charcoal. In this way, it has been found possible to reduce the oxygen of the air by 15-20% which is sufficient to render the action of the accumulated hydrocyanic acid 4 times as efficacious, and hence to reduce the consumption of cyanide by that amount. In 4 to 5 hours, all the insects and their eggs are destroyed and after one hour's ventilation, the air has become normal.

Spreading and Adherence of Arsenical Sprays.—MOORE, W., in *Minnesota Agricultural Experiment Station, Technical Bulletin* 2, pp. 3-50. St. Paul, 1921.

This account is based upon an extensive review of the literature and investigations conducted by the author.

The addition of material similar in chemical constitution to the leaf surface causes the spray mixture to form a film of liquid over the leaf. The positive absorption of the added material at the leaf-spray interface, resulting in a lowering of the interfacial tension, appears to offer the best explanation of the results. Different types of leaves naturally require different materials. Thus organic compounds such as beechwood, creosote, carvacrol, or amyl alcohol, soluble in fats and waxes and but slightly soluble in water, produce good spreading over waxy leaves such as cabbage. Various proteins and plant infusions give good spreading on leaves with surfaces of cellulose even when they are strongly cutinized as in the case of plum and citrus leaves. Suspensions containing small-sized particles adhere better than those with larger particles. An even distribution of the spray over the leaf tends to increase the adherence.

In the latter part of the work, which deals with the adherence of spray materials to the leaf, the author advances a new reason as to why the adherence of one material to the leaf is superior to that of another. He has demonstrated that the leaf surface assumes when wet a negative electric charge, and that suspensoids of the common arsenic compounds ionize in such a way that their particles are also negative. Field tests have confirmed the assumption that spray materials carrying positive electric charges will adhere to the negatively charged leaf surface better than materials exhibiting negative charges. Positive arsenic preparations of different elements were prepared and tested, and ferric arsenate was found to be the most promising material and more toxic than lead arsenate. The presence of ferric hydrogen in the spray material is not desirable since, owing to its absorption of arsenic, it lowers the toxicity of the preparation.

The common compounds of arsenic, such as lead arsenate, Paris green, calcium arsenate, and others, have particles carrying negative electric charges. Arsenic compounds of albuminum, chromium, and iron may be prepared so that the particles carry a positive charge.

As shown in tests with locusts, the ratio of the amount of the arsenic compound in the body to that in the excreta is a better basis of comparing toxicity of different arsenical preparations than tests based on the food consumed or the time required to produce death.

130.—Paria Canella. The Strawberry Rootworm in California. -URBAHNS, T. D., in *Monthly Bulletin of the Department of Agriculture, State of California*, Vol. X. No. 8, figs. 3, pp. 311-313. Sacramento, California, 1921.

Paria Canella has frequently been referred to as a pest of strawberries and *Rubus* spp. in the eastern parts of the United States. The first mention of this pest was made in 1880 and it has since been reported as a strawberry pest of secondary importance in the States extending from the Rocky Mountains to the Atlantic coast. It came to the attention of Californian growers three or four years ago when its destructive work in the foliage was first noticed. The insect had without doubt been present in smaller numbers for several years previously as it was found to be quite widely distributed. It is found over several widely separated areas in the Sacramento, San Joaquin and Santa Clara valleys. Probably about 300 acres are at the present time abundantly infested and on some of these fields the strawberries have been practically destroyed.

The adults hibernate in the fields where they may be found active on the warmer winter days. They feed on the leaves in early spring and may be seen in large numbers in early March, when a dozen or more may frequently be found on a single plant. Eggs are deposited on the plants and in soil crevices. The first eggs are laid in the latter part of March and this continues until May. The maximum is reached in mid-April. The larvae appear in June and soon work their way to the finer roots of the plant. A few of the adults continue throughout the summer, constantly attacking the newly forming leaves. The larvae are fully developed and pupate in July; the new generation appears in early August. These feed ravenously and riddle the leaves. Under Californian conditions, the most severe visible injury results from this attack on the leaves in the autumn and early spring, but

the plants suffer even more in mid-summer when the larvae attack the roots and cause the plant to wilt. Punctures made on the leaf stems result in the drying of many leaves and punctures on the fruit give rise to irregular formation and frequently encourage premature decomposition and decay.

A short description is given by the author with reference to the remarkable fecundity of this beetle, and its ravenous attack shows that it is of more than secondary importance to the Californian growers.

Fields infested should be sprayed with arsenate of lead (3 lb. to 100 gall. water), or dusted with Paris green (1 lb. to 6 lb. flour). This treatment should be given as soon as the newly-emerged beetles have appeared, usually about the latter part of August.

Burning the fields is of some value in destroying hibernating quarters for adults, but they escape destruction from the flames by taking refuge under clods and in the soil crevices.

Where beetles are found in the spring, fields may be treated with one of the above-mentioned insecticides after the spring rains and before the maximum flowering period.

Poison-bran mash prepared according to the regular formula as used for grasshoppers has been used with considerable success after the berries began to develop when it is too late to use the insecticides. It has been reported that beetles were found to feed freely upon the poisoned bait.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Any one desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

1194.—**The Agricultural Production of Czecho-Slovakia.**—*Bulletin of the Ministry of Agriculture of the Republic of Czecho-Slovakia*, Year I, No. 2, pp. 9-16. Prague, July 1, 1920.

1195.—**Agriculture in the State of Rio de Janeiro, Brazil, according to the President's "Message," addressed to the State Assembly. (Session of August 1, 1921).**—*Lavoura e Criacao*, Year VI, No. 8, pp. 162-176. Rio de Janeiro, August, 1921.

1196.—**The Influence of Accessory Factors (Vitamines) on Dentition.**—Howe, P. R., in *Bulletin de la Société Scientifique d'Hygiène alimentaire et d'Alimentation rationelle de l'Homme*, Vol. IX, No. 5, pp. 308-313. Paris, 1921.

1199.—**The Factors Determining Soil Temperature.**—Keen, B. A. and Russell, E. J. (Rothamsted Experiment Station, Harpenden, Herts), in *The Journal of Agricultural Science*, Vol. XI, Part 3, pp. 211-239. Cambridge, July, 1921.

1203.—**Direct Application of Mineral Phosphates to the Soil in the United States.**—Stone, R. W., in the *American Fertilizer*, Vol. LV, No. 9, pp. 82-94. Philadelphia, Oct. 22, 1921.

1204.—**Experimental Researches on the Manufacture of Nitrates by the Biochemical Oxidation of Ammonia in France.**—Boullanger, E., in *Annales de l'Institut Pasteur*, Vol. XXXV, No. 9, pp. 575-602. Paris, 1921.

1206. **Contribution to the Study of Wheat Scald.—Researches on the Physical, Chemical and Agricultural Characters of the Grain, in Italy.**—Draghetti, A., in *Le Stazioni Sperimentali Agrarie Italiane*, Vol. LIV, pp. 257-277. Bibliography. Modena, 1921.

1208.—**Sterility in Wheat Hybrids.**—Sax Karl, in *Genetics*, Vol. 6, No. 4, pp. 399-416. Baltimore, July, 1921.

1213.—**Experiments in Treating Wheat Grain by Immersion in Nutrient Solutions, in Italy.**—D'Ippolito, G., in *Le Stazioni Sperimentali Agrarie*, Vol. LIV, Parts 7, 8, 9, 10, pp. 248-256. Modena, 1921.

1219.—**Trifolium Squarrosum, a Species of Clover behaving like Bersim and Capable of Replacing the Latter in some Cases.**—Fiori, A., in *L'Agricultura Coloniale*, Vol. XV, No. 8, pp. 413-416. Florence, August 1, 1921.

1232.—**The Black Walnut (Juglans Nigra): Its Growth, Distribution, Management and Utilisation.**—I. Baker, F. S. (Forest Examiner) Black Walnut: Its Growth and Management, *U.S. Department of Agriculture*, Bulletin No. 933 (Contribution

from the Forest Service. Professional Paper), pp. 1-4. Washington, D.C., March 8, 1921.—II. BRUSH, W. D. (Scientific Assistant) Utilisation of Black Walnut. *Ibid. Bulletin* No. 909, pp. 1-89. Washington, D.C., January 17, 1921.

1240.—**Research on the Bacilli of Avian Tuberculosis.**—JOUSSET, A., in *Annales de l'Institut Pasteur*, Vol. XXXV, No. 9, pp. 603-620. Paris, 1921.

1242.—**Physiology of Phosphorous and Calcium Metabolism of Dairy Cows.**—MEIGS, E. B., BLATHERWICK, N. R., CARY, C. A. and WOODWARD, T. E., in *The Journal of Biological Chemistry*, Vol. XL, No. 2, pp. 469-500. Baltimore, December, 1919.

1253.—**A New Method of Selecting Milch Cows.**—MAUPAS, H., in *Journal d'Agriculture Pratique*, Year LXXXV, Vol. II, No. 33, pp. 151-152. Paris, August, 1921.

1269.—**The Water-Raising Machines and Motor Engines Most Suitable for Land-Drainage Plants.**—CARBONARO, D., in *Giornale del Genio Civile*, I. Year LVIII, pp. 237-261. Rome, May 31, 1920; II. Year LIX, pp. 409-439, pp. 469-496, July 31 and August 31, 1921.

1284.—**Determination of the Keeping Quality of Milk.**—I. BAKER, J. C., and VAN SLIKE, L.L., in *New York Agricultural Experiment Station, Geneva, N.Y., Technical Bulletin* No. 72, 8 pp. Geneva, N.Y., June, 1919.—II. COOLEDGE, L. H. and WYANT, R. W., in *Journal of Dairy Science*, Vol. III, No. 2, pp. 156-166. Baltimore, 1920

1286.—**The Alcohol Test as a Means of Determining the Quality of Milk for Condensed Milk Factories.**—DAHLBERG, A. O. and GARNER, H. S., in *United States Department of Agriculture, Bulletin* No. 944, 13 pp. Washington, May 12, 1921.

1287.—**The Sporogenes Test as an Index of the Contamination of Milk.**—AYERS, H. S., and CLEMMER, P. W., in *U.S. Department of Agriculture, Bulletin* No. 940, 20 pp. bibliography of 15 works. Washington, April 25, 1921.

1301.—**A Forest Insectarium in Spain.**—*Revista de Montes*, Year XLV, No. 1065, pp. 466-467. Madrid, November 1, 1921.

5.—**Information Concerning the Amazon Region, Brazil.**—LECOINTE, P., in *Revista Commercial, Industrial e Agricola do Para*, Year 10, No. 13, pp. 414-429. Belem (Para), December, 1920.

17.—**Availability of Organic Nitrogenous Compounds.**—ROBINSON, C. S., WINTER, O. B. and MILLER, E. J., in *The Journal of Industrial and Engineering Chemistry*, Vol. XIII, No. 10, pp. 933-936. New York, Oct. 1, 1921.

19.—**Carbonisation of Plants by Combustion Gases.**—RIEDEL, F., in *Chemiker Zeitung*, Year XLV, No. 104, pp. 829-830. Cothen, August 30, 1921.

26.—**Study of Barley Hybrids, Especially from the Standpoint of Fixity of the Segregation of Characters in the F2.**—BLARINGHEM, L., in *Annales de la Science Agronomique*, Year 38, Series 6, pp. 177-230. Paris, August, 1921.

33.—**Determination of the Origin of Linseed on the Market.**—FILTER, P., in *Die Landwirtschaftlichen Versuchsstationen*, Vol. XCVIII, Parts 5-6. Berlin, 1919.

59.—**Forestry in China.**—*Republic of China, Government Bureau of Economic Information, Bulletin*, S. I, No. 11, Pekin-Shanghai, May 6, 1921.

63.—**Contribution to the Study of the Tuberculosis of Domestic Animals in Reference to Human Tuberculosis.**—GRILLI, V., *La Clinica veterinaria*, Vol. XLIV, No. 18, pp. 518-523. Milan, September 30, 1921.

71.—**The Animal Parasites of Foxes with Special Reference to Some Species of Hookworms (Uncinaria).**—I. RILEY, W. A., An Annotated list of the Animal Parasites of Foxes, in *Parasitology*, Vol. XIII, No. 1, pp. 86-96, Bibliography of 34 works. London, March, 1921.—II. RILEY, W. A., and FITCH, C. P., The Animal Parasites of Foxes with special reference to Hookworms, in *Journal of the American Veterinary Medical Association*, Vol. LIX, New Series, Vol. 12, No. 3, pp. 294-305, bibliography of 8 works. Washington, June, 1921.

79.—**A Mendelian Experiment in Crossing Aberdeen-Angus and West Highland Cattle: Experiments made in Great Britain.**—WATSON, J. A., in *Journal of Genetics*, Vol. XI, No. 1, pp. 59-67, bibliography of 14 works. Cambridge, April, 1921.

85.—**Comparison between the Milk Yield of Young Cows and Mature Cows. Researches made in the United States.**—HOOPER, J. J., in *Journal of Dairy Science*, Vol. IV, No. 5, pp. 451-452. Baltimore, September, 1921.

94.—The Power Farming Trial Week at Ondes, Haute Garonne France.—Blanc, A., in *Le Progrès agricole et viticole*, Year 38, No. 47, pp. 495-501. Paris, November 20, 1921.

95.—Trials of a Tractor Running on Poor Gas in France.—Greilsammer, R., in *Comptes rendus de l'Académie d'Agriculture de France*, Vol. VII, No. 32, pp. 696-701. Paris, October 19, 1921.

96.—Mechanical Flax-Gatherers at the Show Held at Wattignies-Lez-Lille France.—*Génie Rural*, Year XIV, No. 110, pp. 24-25, Figs. 2. Paris, September, 1921.

108.—New Studies on the Life-History of "Malvacea Rust" (Puccinia Malvacearum).—Eriksson, J., in *Comptes rendus Hebdomadaires des Séances de l'Académie des Sciences*, 1921, 2nd. Half-Year, Vol. CLXIII, No. 20 (Nov. 18, 1921), pp. 925-928.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief indication of the contents of the more important articles in the July-August number of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

Agricultural Co-operation in Austria during the War.—18 pages. Gives an account of the work and progress during the war, of co-operative credit societies, co-operative warehousing societies, co-operative dairies, co-operative societies for the sale of eggs, co-operative societies for the sale of live stock, and miscellaneous societies.

Co-operation for the Marketing of Agricultural Products and the Supply of Farm Requisites in Canada.—48 pages. The first installment of a very comprehensive and thorough article on co-operative marketing in Canada. The second half of this article will appear in the September number of the International Review of Agricultural Economics. This installment begins with a detailed account of the laws of the different Provinces relating to agricultural co-operation. The co-operative sale of grain is then dealt with, including accounts of the associations of grain growers, the Grain Growers' Grain Company, The Saskatchewan Co-operative Elevator Company, The Alberta Farmers' Co-operative Elevator Company, The United Grain Growers' Limited, and of the efforts to organize a wheat pool. The author then deals in great detail with co-operative live stock marketing in the provinces, co-operative dairying, and the co-operative marketing of wool.

In the next installment the author will discuss the co-operative sale of eggs, poultry, fruit and vegetables, tobacco and seeds, and the co-operative purchase of farm supplies.

The Work of the Agricultural Wages Board in England and Wales.—46 pages. The Agricultural Wages Boards which were established in England and Wales, in Scotland and in Ireland during the war for the purpose of fixing minimum wages have since been replaced by Joint Collection Committees which determine wages by agreement between the representatives of the employers and of the workers. The article in the Institute Review of Agricultural Economics gives a full account of the work of the Agricultural Wages Board in England and Wales and a full statement of the wages fixed by it from its establishment under the Corn Production Act of 1917 to its dissolution in 1921.

Other articles in the July-August number of the Review are: A Scheme of Drought Insurance in Australia; An Austrian System of Mutual Aid amongst Peasants in Case of Fire; A New Agricultural Letting Agreement in Argentina; Grants of Land for Colonization in Ecuador; An Official Experiment in Home Colonization in France.

AGRICULTURAL STATISTICS

FOREIGN CROP CONDITIONS

(December 18, 1922)

United Kingdom.—The condition of winter cereals on December 1st was generally favourable. Sowing had been carried out under excellent conditions. A normal acreage is reported to have been seeded to wheat.

France.—According to a cablegram received from Rome on December 18th, cereal sowings had been completed under favourable conditions, and the early sowings were germinating vigorously. The area sown is reported officially to slightly exceed that of last year.

Italy.—In November the weather was favourable for field work and on December 1st the condition of autumn sown cereals was good. The Italian Government has decided to continue the suspension of the import duty on wheat for an indefinite period.

Germany.—The sowing of winter cereals was delayed by the late harvest and adverse weather. At the end of November cereals were germinating very slowly. There are reports of a decrease in acreage of winter wheat. The Saxon Government proposes a ten per cent admixture of potato flour with bread flour, and it is announced that rationing of bread flour will be introduced in German Silesia.

Russia.—A Report by the Russian Commisar of Agriculture says that the area sown to winter cereals is 15 per cent less than a year ago, and only 40 per cent of the prewar area. There is a deficiency of seed, and of draught animals. The weather since the middle of October has not been favourable.

Spain.—Seeding was carried out under favourable conditions and an increase in acreage is reported.

Roumania.—Field work was greatly hindered by continued rains. The area sown to winter cereals is expected to be much smaller than last year.

Jugo-Slavia.—Seeding is very backward owing to heavy rains and it is doubtful if the acreage sown to winter wheat will be as large as last year.

Czecho-Slovakia.—Agricultural operations made very slow progress on account of unfavourable weather. There is a distinct inclination on the part of the new Government to tax cereal imports in the interest of the farming community.

Hungary.—Sowing was delayed at first, but fine weather in the second half of November enabled farmers to proceed actively with seeding. The appearance of the winter cereals was quite satisfactory.

North Africa.—In Algeria, sowings were being carried out under favourable conditions Efforts were being made to cultivate a larger acreage than last year. Sowings in Tunis were being delayed by drought.

India.—Sowing of wheat was completed under very favourable circumstances, and the outlook is in every way promising.

CROPS IN THE SOUTHERN HEMISPHERE

Argentina.—The first forecast of the harvest of Argentina, according to the International Institute of Agriculture, is 215,320,000 bushels, from 16,081,000 acres, compared with 180,643,000 bushels from 13,927,000 acres last year. The harvest which begins in the extreme north about the middle of November, becomes general about December 1st, and finishes in the south about January 1st, was, according to latest reports being carried out under favourable weather conditions.

Australia.—The latest estimate of wheat acreage is 10,000,000 compared with 9,587,000 last year. Estimates of the crop now being harvested range from 88,000,000 to 105,000,000 bushels, compared with 132,285,000 bushels last year. There will be practically no carry over of old wheat on January 1st.

South Africa.—Harvesting was well advanced on December 1st and a medium crop of wheat was expected.

UNITED STATES FINAL CROP REPORT

The field crops of the United States in 1922 compared with 1921.

Crops	Area 1922	Area 1921	Production 1922	Production 1921
Wheat	61,230,000	62,408,000	856,211,000	794,893,000
Corn	102,428,000	103,850,000	2,890,712,000	3,080,372,000
Oats	40,693,000	44,826,000	1,215,496,000	1,060,737,000
Barley	7,390,000	7,240,000	186,110,000	151,181,000
Rye	6,210,000	4,228,000	95,497,000	57,918,000
Buckwheat	785,000	671,000	15,050,000	14,079,000
Flaxseed	1 308,000	1,165,000	12,238,000	8,112,000
Potatoes	4,331 000	3,815,000	451,185,000	346,823,000
Sweet potatoes	1,116,000	1,066,000	109,534,000	98,660,000
			Tons	Tons
Hay, tame	61,208 000	58,742 000	96,687,000	81 567,000
Hay, wild	15,842 000	15,483,000	16,104,000	15,235,000

UNITED STATES WINTER CEREAL ACREAGE

Winter wheat in the United States was sown this fall on 46,069,000 acres or 3 2 per cent less than the revised estimated area sown in the fall of 1921, which was 47,611,000 acres. The condition of winter wheat on Dec. 1 was 79·5 per cent of a normal compared with 76 a year ago, 87·9 in 1920, and 87·9 the ten year Dec 1 average condition.

The area sown to rye this fall is 5,508,000 acres, or 11·3 per cent less than the revised estimated area sown in the fall of 1921, which was 6,210,000 acres. The condition of the crop on Dec. 1 was 84 3 per cent of a normal, compared with 92 2 a year ago, 90·5 in 1920, and 90·8 the ten year December 1 average.

PRODUCTION OF CORN, POTATOES AND SUGAR BEETS[1]

CORN

Countries	Area 1922	Area 1921	Area Average 1916-1920	Production 1922	Production 1921	Production Average 1916 1920
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Austria	149,000	112,000	103,000	3,703,000	2,521,000	2,122,000
Bulgaria	1,423,000	1 418,000	1,407,000	16,749,000	34 386 000	20,851,000
Hungary	1,716,000	2,167,000	2,017,000	32,494,000	31 703 000	50,156,000
Italy	3,707,000	3,707 000	3,750,000	70,863,000	94 484 000	82,817,000
Roumania	8,411,000	8,510,000	8,143,000	107,203,000	110 935,000	182,033,000
Switzerland	4,000	5,000	6,000	185,000	218,000	274,000
Czechoslovakia	395,000	385 000	369,000	8,996 000	9,432,000	9,648,000
Canada	318,000	297,000	243,000	17,382 000	14 904 000	11 905,000
United States	102,428,000	103,850,000	105,073,000	2,890 712 000	3,080,372 000	2,836,318,000
Philippines	1,329,000	1,344,000	1,111,000	14,645,000	14 645 000	15 854 000
Algeria	19,000	24,000	18,000	276 000	354 000	245,000
Totals	119,899,000	121,819,000	122,240 000	3,163 208 000	3,395,163 000	3,209,972,000

(1) Tables giving the production of Wheat, Rye, Barley and Oats were published in the November December, 1922, Number of the Agricultural Gazette

POTATOES

Countries	Area			Production		
	1922	1921	Average 1916-1920	1922	1921	Average 1916-1920
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Germany..	6,723,000	6,544,000	5,688,000	1,442,189,000	960,898,000	906,764,000
Austria ...	379 000	327,000	265,000	39,796,000	30,607,000	22,365,000
Belgium..	445,000	419,000	377,000	79,366,000	71,535,000	93,422,000
Bulgaria ..	20,000	19,000	20,000	1,360,000	1,049,000	977,000
Denmark..	204,000	208,000	190,000	44,239,000	50,174,000	39,131,000
Finland	185,000	198,000	203,000	16,009,000	10,245,000	17,691,000
England and Wales	561,000	558,000	518,000	146,346,000	110,432,000	119,008,000
Hungary.........	467,000	665,000	626,000	33,859,000	45,899,000	75,968,000
Latvia	171,000	146,000	122,000	24,598,000	24,759,000	13,761,000
Norway	135,000	130,000	125,000	32,727,000	25,996,000	33,367,000
Netherlands......	454,000	441,000	433,000	124,523,000	90,348,000	102,016,000
Poland	5,303,000	4,796,000	4,062,000	1,230,743,000	617,278,000	664,926,000
Sweden ..	400,000	365,000	386,000	68,784,000	68,526,000	66,359,000
Switzerland.	112,000	113,000	136,000	24,820,000	25,373,000	29,498,000
Czechoslovakia	1,607,000	1,574,000	1,494,000	290,468,000	159,070,000	183,812,000
Canada ...	684,000	702,000	694,000	99,675,000	107,248,000	101,390,000
United States	4,331,000	3,815,000	3,889,000	451,185,000	346,822,000	373,423,000
Algeria .	47,000	46,000	39,000	1,925,000	653,000	1,390,000
Tunis	3,000	3,000	2,000	165,000	147,000	136,000
Totals	22,231,000	21,069,000	19,269,000	4,152,777,000	2,747,757,000	2,845,404,000

SUGAR BEETS

Countries	Area			Production		
	1922	1921	Average 1916-1920	1922	1921	Average 1916 1920
	Acres	Acres	Acres	Tons	Tons	Tons
Germany.	1,031,000	963,000	775,000	11,938,000	8 796,000	7,581,000
Austria. ..	28,000	19,000	16,000	195,000	103,000	113,000
Belgium..	146,000	143,000	119,000	1,626,000	1,613 000	1,396,000
Bulgaria..	24,000	21,000	23,000	237,000	191,000	90,000
Denmark..	60,000	86,000	88,000	730,000	957,000	976,000
Finland.......	3 000	3,000	2,000	15,000	11,000	10,000
Hungary.......	89,000	130,000	78,000	632 000	598,000	703 000
Netherlands......	142,000	182,000	133,000	2,035,000	2,985,000	1,724 000
Poland .	270,000	197,000	175,000	2,945,000	1 244,000	1 527,000
Sweden .	41,000	120 000	89,000	473 000	1,636,000	1,006,000
Switzerland . ..	3,000	3,000	1,000	37,000	47,000	15,000
Czechoslavakia.	520,000	544,000	518,000	5,145,000	4,488,000	5,270,000
Canada ..	21,000	28 000	22,000	173,000	268,000	204 000
United States	606,000	809 000	698,000	5,009,000	7,678,000	6,625 000
Totals	2 984 000	3 221 000	2 737,000	31,190 000	30,618,000	27 740 000

EXPORTS OF WHEAT AND FLOUR FROM CANADA AND THE UNITED STATES

(FLOUR REDUCED TO EQUIVALENT QUANTITIES OF WHEAT)

Month	Canada	United States
	Bushels	Bushels
Year 1921-22	185,769,000	267,898 000
August 1922	14,247,000	38,966,000
September	12,372,000	31,839,000
October	41,442,000	25,077,000
November	60,781,000	

Canada has exported in the first four months of the grain year 128,842,000 bushels of wheat against 71,896,000 bushels in the same period last year, and a total export of 185,769,000 bushels for the grain year 1921-1922.

The United States has exported in the three months August, September and October 95,882,000 bushels against 131,279,000 bushels in the same three months last year.

LIVE STOCK STATISTICS

DENMARK

Classification	Number on		Increase (+) or Decrease (−)	
	15 July, 1922	15 July, 1921	In number	Per cent
Horses	575,773	597,988	−22,215	− 3·7
Cattle	2,525,348	2,590,203	−65,555	− 2·5
Sheep	411,875	521,932	−80,057	−15·3
Goats	44,021	50,002	− 5,978	−12·0
Pigs	1,899,019	1,429,908	+469,111	+32·8
Poultry	19,100,000	17,800,000	+1,300,000	+ 7·3

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 10: No. 2 March-April, 1923

The AGRICULTURAL GAZETTE OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA

MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART I

DOMINION DEPARTMENT OF AGRICULTURE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

PART III

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS. PUBLICATIONS AND NOTES

PART V

THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The AGRICULTURAL GAZETTE
OF CANADA

VOL. X MARCH-APRIL, 1923 No. 2

DEPARTMENTAL ASSISTANCE TO MARKETING

PRODUCTION is no longer the dominant note in agriculture. Except during the period of the war, the disposal of the products of the farm at a profitable rate has for many years more and more engaged the minds and energies of both farmers and officials. It is not only the finding of a consumer that concerns the producer, but also the securing of speedy and safe transportation, more particularly of the products classed as perishable. Many trained minds have given thought to this problem, and economists have worked hard and long to find the solution and to bring about improved conditions. System after system has been put to the test in an attempt to bridge the gap between producer and consumer and still conferences to thresh out the whole problem seem necessary.

The problem of marketing has engaged the attention of officials of the Department of Agriculture for many years. About twenty-eight years ago a step was taken towards safeguarding perishable products in transit to market. The icing of cars carrying butter during the hot summer months was the first important service put into operation Transatlantic cargo inspection began five years later, and from time to time since then further services were undertaken until practically the whole range of farm products, with the exception of wheat and other grains, which are dealt with by the Department of Trade and Commerce, has come within the influence of the marketing services of the Department of Agriculture.

The services of the department directly related to marketing, and operated by the different branches, may be classified in five divisions:

1. (*a*) Standardization and grading for export;
   (*b*) Standardization and grading for the home market.
2. Safeguarding perishable products in transit and the inspection of products at harbour terminals.
3. The promotion of co-operative marketing.
4. The regulation and control of stock yards.
5. Markets intelligence.

The necessity for standardizing and grading products that have to compete in the world's markets was never more apparent than at the present time. This was the conclusion of the Deputy Minister of Agriculture, Dr. Grisdale, when he studied the question in Great Britain in the summer of 1922. In his opinion, the only countries that were making progress in their export trade in agricultural products were those that presented their goods so graded and marked as to establish confidence in their quality.

The standardization and grading of agricultural products are carried out under the provisions of three Acts of Parliament—The Inspection and Sale Act, The Live Stock and Live Stock Products Act, and The Dairy Produce Act. In addition certain classes of seeds are graded for export under a ministerial order, the grade standards used being those provided in the Seed Control Act.

The Inspection and Sale Act, under which the grading and packing of fruit and vegetables is regulated, came into force in 1901 under the title of The Fruit Marks Act. In its original form it provided for the uniform packing of barrels and boxes of apples for export and the marking of closed packages according to the grades laid down in the regulations. The mark is required to indicate the variety, the grade, and the name and address of the packer. The Act has been amended from time to time until it covers both closed and open packages of fruit, whether for local markets, for export, or coming from other countries. This measure was until 1914 administered by the Dairy and Cold Storage Branch, when the Fruit Division of that Branch was made a separate Branch of the Department. In administering this law the official inspectors are stationed at assembling points and at the principal markets to examine samples of shipments and to see that they conform to the regulations.

The official grading of vegetables was brought within the administration of the Fruit Branch in 1922 by the passing of The Root Vegetables Act. This Act provides for the grading of potatoes and onions, the marketing of packages, and the sale of vegetables by weight.

The grading of eggs for interprovincial, export and import trade was undertaken by the Live Stock Branch about five years ago. The regulations governing this work are under The Live Stock and Live Stock Products Act of 1917. For the purposes of administration the Dominion is divided into eastern and western sections with the central line at Port Arthur. Inspection is made at principal shipping points to see that the eggs packed for shipment are graded according to legal standards and marked accordingly. The grades are Specials, Extras, Pullet Extras, Firsts and Seconds. Dr. Grisdale, on his return from Great Britain, declared that Canadian eggs have an undisputed position in the British market due to the government grading regulations.

Hog grading was commenced in the fall of 1922, and has been established on a system agreed upon by representatives of hog raisers, bacon curers, marketing authorities, and the Live Stock Commissioner, under whose direction it is carried on according to regulations under The Live Stock and Live Stock Products Act. It applies to all hogs handled through the abattoirs for making Wiltshire sides and is intended primarily to stimulate the production of the bacon type so necessary to the export trade by securing to the hog raiser the true market value for his product. The grades provided are Select, Thick, Smooth, Shop Hogs, Heavies, Extra Heavies, Feeders, Roughs, Sows, and Stags. A premium is paid for hogs of select type. Inspectors are stationed at stock yards, abattoirs and other centres where the grading is done.

Dairy produce will come under official grading at the beginning of April, 1923. The grading will apply to butter and cheese, and will be carried out at central points whence these products are despatched for the overseas market.

In order to protect farmers against losses from the use of inferior seed, feeding stuffs and fertilizers, and to facilitate the distribution and sale of these commodities in the home market, three acts of Parliament are administered by the Seed Branch of the Department. These are the Seed Control Act, which provides for both compulsory and optional grading of seeds in respect of their purity and germination; the Feeding Stuffs Act, which provides that commercial feeding stuffs be sold subject to analysis of nutrition, and the ingredients from

which they are manufactured, and the Fertilizers Act, which provides that commercial fertilizers be sold subject to the percentages of the plant food substances, nitrogen, phosphoric acid and potash.

For purposes of administration, laboratories are maintained and operated at Ottawa, Toronto, Winnipeg and Calgary, and, in addition, thirteen laboratories connected with the Department of Health or Canadian colleges and universities provide analytical service in chemistry.

In order to enforce these Acts, the Dominion is divided into six inspection districts, and the inspection work in each of these is under the supervision of a district inspector for the purpose.

The seed of Canadian-grown fibre flax, alsike and red clover is graded for export by the Seed Commissioner. Flax seed grading was put into effect four years ago at the request of the Irish Board of Agriculture when seed was needed in Ireland for fibre flax production. The grading of alsike and clover seed is of recent adoption. These seeds are graded according to quality, purity and colour, certificates of grade being attached to sealed packages when ready for shipment. The selling of the seed for export on the basis of Canadian inspection for grades is optional with the exporter.

Safeguarding Perishable Products

For the purpose of fostering trade in food products, measures were put into effect to safeguard the condition of shipments in transit. In the year 1900 the Dairy and Cold Storage Commissioner instituted the Cargo Inspection Service. This provides for inspection of perishable products at Canadian ports on arrival at the docks for loading on ship-board. Inspectors take note also of the manner in which the handling and loading is done and report upon the number of packages, marks, etc., of each consignment. Temperature records secured during the voyage and reports of the condition of shipments on landing are collected and made available to shippers. This service covers dairy products, fruits, meats, canned goods, and eggs. Reports of faulty conditions or handling of other than dairy products are transmitted to the respective branches of the department concerned with the product.

To minimize the deterioration of cheese and butter being hauled on railways to market in hot weather, the department, through the Dairy and Cold Storage Branch, operates refrigeration services. For cheese in carload lots travelling to Montreal, Quebec and Halifax, the Branch provides iced refrigeration during the months of June, July and August. Shippers of less than carload lots of cheese, butter and eggs are assisted through an arrangement with the railway companies to operate "pick up" refrigerator cars over specified routes leading to Montreal, Toronto and Halifax. This service operates from early in May until the end of September. For butter cars it has been in operation since the year 1895, while the iced cheese car service was started eight years later.

To maintain satisfactory temperatures for butter and cheese in transit, a system of inspection of iced butter and cheese cars is carried on. Shipments arriving in Toronto, Montreal and Halifax are examined by inspectors and reported upon with regard to the quantity of ice in the bunkers, the quantity of cheese and butter in the cars, the condition of the cars relating to cleanliness, temperature, and the manner in which the packages are stowed. Unfavourable conditions are reported to the persons responsible.

By arrangement with carrying companies, the Fruit Commissioner has been able to secure important im-

provements in the transportation of perishable fruit and vegetables. These have reference particularly to loading and unloading, favourable routing and rating, car fittings, stoppage and storage-in-transit privileges, etc.

The Promotion of Co-operative Marketing

Following a study of the sheep industry in Canada by a special commission in 1910, the Live Stock Commissioner took steps to promote the co-operative marketing of wool. Sheep raisers were encouraged to organize themselves into clubs and to avail themselves of the services of official graders. An outgrowth of this movement was the organization of the Canadian Co-operative Wool Growers, Limited. Short courses of instruction in wool-grading are conducted by the Live Stock Branch, and assistance is given by district sheep promoters in collecting and shipping wool on the co-operative plan. The co-operative marketing of sheep and lambs is also encouraged under the same direction through the organization of local associations. Assistance is provided in the marketing of both live and dressed sheep and lambs. The service includes sorting, shipping, prorating, and selling. Similar assistance is afforded in the Maritime Provinces to co-operative swine and cattle marketing, the purpose of which is to move the surplus above local demand.

Activities relating to the co-operative marketing of eggs by the Live Stock Branch commenced in 1912 by the organization of egg circles throughout the country. As a result of this work in Prince Edward Island, the Prince Edward Island Egg and Poultry Association was organized. Through this organization almost all poultry products of that province are now marketed co-operatively. Equally satisfactory results have ensued in British Columbia, where the British Columbia Co-operative Exchange has become one of the largest handlers of eggs on the Pacific Coast. The carload shipment of live poultry, and to some extent, of dressed poultry, has been fostered, more particularly in New Brunswick and Prince Edward Island.

Regulation and Control of Stock Yards

Through The Live Stock and Live Stock Products Act, the Live Stock Commissioner was given control of the stock yards of the country. This policy was inaugurated for the two-fold purpose of facilitating the handling of stock through the yards and of securing a disinterested control of marketing practices. Under this measure, all public stock yards are subject to federal supervision as regards construction, equipment and operation. The stock yards coming within the purview of this measure are located at Montreal, Toronto, Winnipeg, Moose Jaw, Prince Albert, Calgary, and Edmonton. At each yard, agents are stationed to see that the regulations are carried out, to collect market quotations for the head office of the branch and the press and to give assistance to farmers in the handling of their stock. The enforcement of regulations under this Act has resulted in the bonding of commission men operating on public stock yards, the organization of new. and the re-organization of old, live stock exchanges, the authorizing of standard regulations under which live stock exchanges operate, the standardizing of all charges made on the yards by the stock yard companies or by commission men, and improvement in the accommodation for live stock.

Market Intelligence Service

In agriculture, as in other industries, accurate information as to trade conditions, supply and demand, and current prices is necessary for

the guidance of producers. To supply this, various Branches collect and disseminate by telegraph, by mail and through the press, market news collected both at home and abroad.

A market intelligence service is maintained by the Live Stock, the Dairy, the Fruit, and Seed Branch of the Department. Market reports with respect to eggs, poultry and live stock are issued daily by the Live Stock Branch through the Canadian press. Reports on egg and poultry prices and supplies are transmitted to the head office of the Branch by officials stationed at the principal markets. These are compiled each day and appear the following morning in the daily papers of the country. The live stock daily market service is operated on much the same system. It consists of an analysis of the condition of supply and demand and the values of stock sold. The information is transmitted morning and evening by the officers of each of the stock yards. The morning reports appear in the principal dailies on the evening of the same day, and the afternoon reports on the following morning.

An inter-stockyards telegraph service is maintained in the form of an exchange of market telegrams between stockyards. This tends to equalize values the country over. These messages are prepared by the stockyard agents after careful analysis of the conditions of trade and exchanged daily with other yards in Canada.

During the season of heavy fruit marketing the Fruit Commissioner issues telegraphic market reports showing the wholesale prices, car arrivals and condition of all Canadian fruits and vegetables on the principal domestic and foreign markets. From the first of August until the end of the year these reports are issued twice weekly from Vancouver, B.C., Winnipeg, Man., and Ottawa, Ont. From the beginning of the year until the first of August weekly telegraphic reports are issued from Ottawa only. Collect telegrams or night letters regarding quotations or conditions on any market at any time are despatched upon request.

Weekly market information with respect to eggs, poultry, live stock, wool, and dairy produce, is issued in multigraph form by the Live Stock Commissioner. The weekly egg and poultry market information is secured from British and United States egg-importing houses and from correspondents in Vancouver, Calgary, Edmonton, Regina, North Battleford, Montreal, and St. John. The weekly live stock market reports deal separately with each stock yard in Canada. They comprise an analysis of supply and demand, statistical tables, showing the grading, numbers, average prices, price range for bulk of sales and top prices of all live stock offered for sale, as well as the disposition and comparative receipts during the period.

There is also issued weekly in similar form information of general interest on the live stock and allied industries as regards both domestic and foreign markets. These reports are issued to the press, to agricultural representatives and other officials, and to such individuals as express a desire to receive them. For the information of agricultural, financial and trade journals, a special market report is prepared on the opening market of each week by the stockyards representative and telegraphed to these journals.

The dairy market intelligence service, issued from the Dairy and Cold Storage Commissioner, consists of a weekly market letter, a monthly statement, and a lettergram service. The weekly letter, issued each Monday from early in April until the close of the year, gives the transactions in cheese and butter at the

different auctions and exchanges in Montreal and on country dairy boards during the previous week. Prices of cheese and butter in Toronto and New York for the previous week are also given, as well as values in Toronto and Montreal. Special market letters are issued from time to time as conditions warrant, from January to April. Twice a week the day's prices of cheese and butter at Toronto and Montreal are wired to the different provincial dairy officials, through whose offices the information is distributed within the respective provinces. Collect telegrams or night lettergrams giving the day's prices of either cheese or butter, or both, at Montreal and Toronto, are supplied to anyone requesting them. A monthly dairy newsletter is a compilation of marketing information with respect to dairying throughout the world. It is prepared in multigraph form and is available to anyone who asks for it.

Current prices and supplies of seed, feed and fertilizers on foreign and domestic markets are reported in semi-monthly statements by the Seed Commissioner, and are available on request. Besides being a guide to buyers and sellers of these products in respect to sources and markets, these reports have a value in directing the public with respect to the grades and quality of the products dealt with both in domestic and export markets.

Market requirements with regard to fruit and vegetables in the United Kingdom and European countries are made known to Canadian growers and shippers through a co-operative arrangement between the Department of Agriculture and the Department of Trade and Commerce. The latter department maintains a fruit trade commissioner overseas, who communicates the results of his observations and study to the Dominion Fruit Commissioner, for dissemination throughout Canada.

Information respecting the condition and quantities of fruit and vegetables arriving daily on the principal markets is collected and published in the market report. This service assists in maintaining an equal and uniform distribution of fruit and vegetable products.

THE INFLUENCE OF FEEDS AND FEEDING ON THE TYPE OF MARKET HOGS

By G. B. ROTHWELL, Dominion Animal Husbandman

THE grading regulation pertaining to market hogs, recently brought into effect, has naturally caused much interest in the bacon-type breeds. Intelligent breeders realize that within breeds of swine, as with other classes of stock, there are strains and families of peculiar merit from the standpoints of type, conformation, and economy and rapidity of gain. There is still another factor affecting quality and type in the finished market hog—feeds and feeding. Without claiming particular weight of influence for either factor, it may safely be stated that the question of feeds and feeding so closely interwoven with desirable strain that one complement is useless without a consideration of the other, in an analysis of what goes to the making of select market hogs.

The Lack of Direct Experimental Data

In the records of experiments carried on at the Central Experimental Farm at Ottawa and on the Branch Farms and Stations, the objects sought in the past have had mainly to do with economy of gains, from a great number of comparative standpoints, with different breeds, feeds, methods of feeding, methods of housing, pasturing, methods of weaning, etc. Aside from soft pork investigations, very little experimental work has been carried on with the definite aim of ascertaining the effect of feeds and feeding on the quality of the ultimate product. Nevertheless, the importance of these factors has impressed itself very definitely in a practical way.

Undesirable methods of feeding causing unthriftiness or malnutrition at any period will naturally have an indelible effect on the finished product. But more important still, hogs may be reared in thrifty, healthy condition and still be placed under a handicap in the final analysis. The hog is an animal of plastic nature. His life history is short. Attention or the lack of it to selection and feeding will show itself more rapidly in the general type as evidenced by the individuals of a herd of swine than with any other group of farm animals.

Observations Resulting from Experimental Work

The observations stated here are mainly in reference to feeder or market hogs. Even before this, the feeding of breeding stock should be considered. Sows wintered indoors, fed little or no roughage, succulent or mineral feeds, consuming mostly grain feeds, and with little opportunity for exercise, have been found to produce weak or small litters lacking in vigour, constitution and bone. Hairless litters are common under such conditions. Such few pigs as come through to the finished stage, aside from the question of profit and loss, are likely to show the effects of an unkind fate. They are too often either short and thick or too shallow and poorly developed generally.

A Select Hog.

Assuming, however, that the very important detail of care of breeding stock is regularly appreciated in its relation to the production of the right kind of hogs, the feeding of the hog actually destined for market should be considered.

The weaning period and from weaning until twelve to sixteen weeks of age is the critical period in the life of a bacon hog. Three years of work of an experimental nature at the Central Experimental Farm revealed conclusively that: (1) Young pigs fed rations containing a minimum of fibre and with skim milk available, throve well, had little or no setback incidental to weaning and grew the frame and bone that enabled them later to develop into select market hogs; (2) Weanling pigs fed the same ration without milk were much less thrifty, inclined to be stunted, and developed into slower finishing and thicker, shorter hogs ("thick-smooth," to-day); (3) Pigs fed meal mixture plus tankage and milk were, if anything, less thrifty than where no tankage was used, but developed into select hogs; (4) Pigs fed meal and tankage (no milk), while not of the undesirable type of the pigs getting meal only, were, nevertheless, sufficiently checked in growth to cause their development into market pigs too short, too thick and lacking quality. It will be remembered that these conclusions, as referring to tankage, have reference to the use of this product during the weaning period.

Other experiments of somewhat similar nature indicate similar results. The conclusions reached, which bear of little qualification, are:

"Weaners" at the critical stage

(1) A certain check in growth may be expected at weaning time. The nature and extent of this check has a very great influence on later development.

(2) Supplementing the mother's milk of nursing pigs by easily digested meals with skim milk during the last few weeks effects a gradual change.

(3) In formulating a ration calculated to change as gradually as possible from mother's milk,—and by so doing to reduce to the minimum the weaning checks that so dis-

astrously affect later development—milk is almost a necessity.

(4) The weaning and weaned pig is unable to digest and assimilate much crude fibre. Middlings and oat meal or sifted oats with skim milk is a standard weaning ration, valuable on account of low fibre content and supplying as it does the elements for rapid growth.

The Finished Product

In short, stunted growth in the weanling is usually the result of malnutrition. Later correction is very difficult. The result of improper feeding in the early stages usually holds its influence to the end.

The Effects of Later Feeding

The balance of ration naturally has its effect. Generally speaking, Canadian hog rations have fair balance Heavily carbonaceous rations apparently have no place in the ration of the hog destined for a select. Lots of hogs of identical type and breeding fed at Ottawa (*a*) with the grains (corn, oats, shorts, tankage) separated and fed in a self-feeder, and (*b*) with the same grains mixed by hand, showed that the self-fed hogs selected a ration composed largely of corn (nearly 80 per cent) and finished more rapidly than their hand-fed neighbours. They were classed as typical, thick smooth hogs. The hand-fed lot made slower gains, on a lower grain consumption and graded as selects. One other point· many feeders boast of their ability to finish hogs to market weights in six, five and a half and even five months. These statements are, in many cases, doubtless based on fact, although feeders of live stock frequently have convenient memories and agile imaginative power. In the experience of the Experimental Farm System, it is unwise to strive for too great rapidity of gain, where the disastrous consequences of over-feeding on finished type is ever in the offing. *Any system of feeding a bacon hog that tends toward the too early laying on of fat and prevents the maximum growth of bone and muscle*

during the first four months tends toward the development of a thicker, shorter carcass and away from the type that will make into a lean or leanest side.

The Effect of the Self-Feeder

The above statements have been borne out by several years of experimental work with self-feeders at Ottawa. With hogs of identical type and breeding, these results have been noted: (1) That hand-fed hogs develop more slowly, consume slightly less meal per pound of gain as compared with self-fed lots and finish as select hogs; (2) That self-fed lots finish in less time than the former but are, on the average, a little more fat and thick, particularly in the shoulders. Where such lots (self-fed) received milk, they would grade as selects on a lenient grading. Where self-fed lots received no milk, the tendency has been to finish hogs more of the thick type. Forced or unlimited feeding, particularly during the early stages, undoubtedly has it effect on type at finish.

The Effect of Exercise and Outdoor Life

To grow bone and muscle and to promote proper functioning, exercise has been found absolutely essential up to at least ten to twelve weeks. After that, hogs of the right type at finish can be fed indoors with only small yards for exercise with green feed and mineral matter supplied. In fact, the question of pasture versus soiling for the market hog is still one of contention. Exposure to sun and weather has a marked and lasting effect upon quality. Severe sun-burn causes a check in growth with the consequent shortening up or thickening effect on the hog. Pasturing has given excellent results insofar as finished type has been concerned, where the hogs were 3½ to 4 months old before pastured and where either natural shade was available or the hogs were of a colour better able to withstand the effect of sun than in the case of the white-skinned hog. Given the choice of placing young pigs on shadeless, even though otherwise excellent pasture, or, on the other hand, in some form of cheap pen accommodation providing shade, relative coolness and the provision for regular supply of green food to these pigs in small racks, and the conclusions at Ottawa after many years' observation have all been in favour of inside feeding in cheap quarters. Trying to force a young, white-skinned pig to consume crude fibre that his system was not ready for, under a June and July sun, has almost invariably left a mark on quality of finish.

The Effect of Housing

Much might be written on the effect of proper housing. Repeated experiments have been carried on in types of winter accommodation. Late summer pigs have been wintered in comfortable heated pens. The main difficulty encountered was that of crippling, with a decided effect on finished type. Generally, inside-fed pigs in winter tended, if anything, toward lack of length and scale. Hogs fed in semi-outdoor conditions (partly open sheds supplied with low enclosed sleeping quarters, opening on small yards) finished into select hogs in practically every instance, with no sign of crippling.

The Effect of Minerals

The effect on type of withholding mineral supplements in the case of winter fed hogs has been marked. Access to charcoal, soft coal, earth, lime, bone meal, etc., has noticeably increased scale, length, development of bone. More particularly still has been the desirable effect noted in the proper mineral rationing of breeding stock. Pregnant sows with access to a variety of minerals, will produce, other things being equal, pigs of the right type at birth.

The Effect of Milk Products

To the last has been left this most important of all considerations in this connection. Limiting these remarks purely to effect on type and aside from economy of production, it may be said briefly that, insofar as the Dominion Experimental Farms are concerned, on farms where milk products are available, the raising of select bacon hogs is the rule. Where milk products are scarce or lacking, the quality, thrift and vigour of young pigs is comparatively adversely affected with the consequent effect on type of finish.

In the writer's mind, the fact that there is a comparatively small percentage of select hogs coming to our yards, particularly in the West, is due, in no small measure, to lack or insufficient quantity of milk and abrupt weaning methods. Experiments on the Experimental Farm System have shown that with our Canadian grain rations, there is no full substitute for milk products. There may be partial replacers. There is the possibility that, in the near future, a commercial milk powder may be placed on the market at a price within reach of the swine-raiser who has no milk by-product to feed. At the present time, nevertheless, in the light of all evidence, it is apparent that commercial hogs can be raised without milk. Greater skill, however, is required in feeding. The probability of lowered quality at the finish must be considered with our grading regulations. The feeder with milk at his disposal has the safest, most productive and surest feed during the feeding period and the one feed of all that, other things being equal, practically insures type at finish.

Bacon type ancestry and milk products practically insure the production of select market hogs.

A high priced gun of correct type and reputable manufacture does not necessarily obtain a high average score at the range or trap. The explosive must be right, also the ammunition, and, lastly, the man who holds the gun. The case of the bacon hog is not so very different.

EXPERIMENTS IN TOBACCO CULTURE

I. THE DOMINION TOBACCO STATION, HARROW, ONTARIO

By D. D. DIGGES, Superintendent

THE Harrow Tobacco Station, located near Harrow in Essex county, Ontario, is devoted primarily to research and experimental work with two distinct types of tobacco, namely—White Burley, an air-cured type, and the flue-cured types.

The Burley, or air-cured type, is used largely as a plug-chewing and plug and granulated pipe tobacco

Essex and Kent counties are the chief producing districts for Burley; however, other counties along the lake shore can and do produce it also, the annual production varying from four to twenty million pounds, with the average annual output approximately eight million pounds.

The flue-cured types are extensively used as cigarette and granulated smoking tobacco and, as such, are steadily increasing in favour.

Essex county is the chief producer of the flue-cured types, growing annually some two and one-half million pounds.

On the Harrow Tobacco Station, experiments are being conducted in practically every phase of the culture of the above-mentioned types of tobacco which can be of interest or of practical value to the tobacco grower.

That the experiments being conducted and the results obtained are not only appreciated but are exerting a marked influence throughout the tobacco-growing districts, is proved by the interest shown by the growers, and by the rapid improvement in cultural methods and the consequent improvement in the quality of the tobacco produced during the past few years.

As late as 1917, sterilization of tobacco seed beds was exceptional; the use of foreign-grown seed of uncertain origin and of unknown, and frequently impure, strains was univer-

Harrow Tobacco Station Seed heads of White Burley Tobacco bagged to prevent cross fertilization.

sal; the growing of tobacco seed was very exceptional; the cleaning of seed unknown; the use of insecticides was exceptional; failure in the production of early, thrifty seedlings was very common; the selection of the proper variety for the various types of soil haphazard; the use of chemical fertilizers was very limited and the method of application received but little consideration; very little attention was paid to quality, the yield being the chief, and frequently the only, consideration; and, in fact, in the majority of cases, the cultural methods were haphazard throughout and the element of luck was largely blamed or praised for the results obtained.

Curing barn and kilns Harrow Tobacco Station.

During the past few years, in direct contrast to the above-mentioned state of affairs, one finds the sterilization of tobacco beds with steam to be universal. The demand for acclimated, cleaned seed of known variety and purity is now so great as frequently to exhaust the stock of one hundred pounds grown annually on the Harrow Station, in addition to large quantities produced by local growers (one-seventh of an ounce of seed seeds 100 square feet of tobacco bed and plants an acre or more). The use of insecticides in controlling pests is almost universal. Failures in the production of thrifty early seedlings have been greatly reduced; while the varieties to be grown are carefully selected. The use of chemical fertilizers has become almost universal, some growers mixing their own, and the users striving to understand the art of fertilizing most advantageously and demanding information regarding analysis, quantity to be used and method of application. Further, there is a realization of the value of quality—an honest effort being apparent on the part of the majority of the growers to produce quality as well as quantity—and finally there is a general improvement in cultural methods from transplanting to the marketing of the crop.

It is believed that the work done at the Harrow Station has been a help to the grower in his effort to improve the quality and quantity of his tobacco crop. Some of the main results of the Station's experimental work are:—

It has been proved that sterilization of the tobacco seed beds with steam not only eradicates weeds and

diseases but also results in the production of earlier and more thrifty seedlings.

It has been proved that the glass covered, semi-hot bed will produce plants as early as will the greenhouse, and that it frequently produces more robust plants than will the greenhouse.

The best distances for transplanting the various varieties for both yield and quality have been determined.

The use of chemical fertilizers has been shown to be very profitable, the net return from their use during the past seven years ranging from 126 per cent to 870 per cent.

The best method of applying the fertilizer has been determined, and the best analysis and quantity to be used on different soils and for various varieties have been studied and satisfactory formulae determined.

The best varieties of tobacco for various soils and conditions have been determined.

It has been proved that acclimated seed gives earlier seedlings and plants that not only ripen earlier but more uniformly. Large quantities of seed of the varieties common to the district are grown annually for distribution.

The most effective time for manuring and ploughing the soil for tobacco has been determined.

The best rotations to be followed in tobacco culture have been ascertained.

The most economical and effective insecticide has been found, as well as the proper rate, form and method of application.

Fungicides for the control of diseases have been tested.

The most economical methods of harvesting and curing have been determined, as well as the effect of various methods on the quality of the cured product.

In addition to the above-mentioned work, valuable information has been obtained on many other phases of tobacco culture.

During the past season, in an endeavour to solve the fuel problem for the growers of flue-cured tobacco, a problem which is most vital and constantly becoming more acute, the Harrow Tobacco Station tested out the curing of tobacco with steam heat. Although this was decidedly a new departure, in an untouched field, it was proved conclusively that tobacco could be flue-cured economically and satisfactorily in this manner. While the experiment met with the approbation of all of the growers and while some of them have already purchased boilers and announced their intention of employing steam on a commercial basis, it is too early to estimate the possible value of this experiment. However, with fuel rapidly becoming scarcer and more expensive it may prove to be the only solution for a large number of tobacco growers.

II. THE FARNHAM TOBACCO STATION

By J. E. MONTREUIL, Superintendent

An experimental field for the growing of tobacco was established by the Dominion Tobacco Division at St. Césaire de Rouville, Que., as early as 1908, but it was only in 1912 that the Farnham Experimental Station was established. This Station, although handicapped by the war, and, as yet, comparatively young, has had nevertheless a very great influence on the progress and improvement of tobacco-growing in the Province of Quebec, and particularly in those counties through

which the Yamaska river flows. As a matter of fact, the progress noted in tobacco-growing in the counties of Rouville, Iberville and Missisquoi, followed the establishment of this Station. Since its inception, the Station advised growers to limit the number of varieties grown; but it is specially in popularizing those varieties for which there is a demand among the manufacturers, and in convincing the latter of the merits of the Canadian leaf, that it has contributed to the progress of the tobacco industry in the district to the south of Montreal.

Although tobacco was grown in the Yamaska valley for many years before 1912, there was no regular market for the varieties, as these had been chosen particularly for their large yields, and the crop of pipe tobaccos (sold in leaf form) had almost reached the point of overproduction.

By encouraging the growing of the binder types for cigars, the station opened a new outlet, and the growers could then increase the areas of their plantations.

By careful selection, the ordinary Comstock, which usually came from seed imported from the United States, was improved to such an extent that one might believe it to be a new variety. Mr. Chevalier makes the following statement in regard to this variety: "By dint of systematic selection, we have maintained the thinness and large size of the Comstock, while replacing its rather pointed leaf by one that is comparatively oval-shaped."

While the shape of the leaf was being improved, the yield of the crop was increased. In 1908, the average yield for Comstocks was 1,000 to 1,200 pounds; our present Comstocks give us, on land of average fertility, a mean yield of 1,400-1,500 pounds per arpent, an increase of at least 200 to 300 pounds. At the Farnham Station, where the land is only of moderate fertility, the average yield for 1920, 1921, 1922, was 1,584 pounds per arpent, or 2,156 pounds per acre.

A survey of the Yamaska valley plantations would show that at least 75 per cent of the binder tobaccos grown are of the Comstock variety, improved by the Tobacco Division of the Central Experimental Farm and the Farnham Station. Also that estimating the yearly crop at 2,000,000 pounds, and the average price at 15 cents per pound—a figure that is undoubtedly below the average price of the last ten years—it will be seen that the improved Comstock brings to the growers of Missisquoi, Iberville and Rouville counties, a yearly increased return estimated, at the very lowest, at between $40,000 and $50,000.

But the work of the Farnham Station has not been limited to the improvement of Comstock. By means of selection and cross-breeding, the type of several varieties has been improved and fixed and new hybrids have been originated, one of which, the Yamaska, seems to be very promising. This new creation yields almost as much as the Comstock, its leaves are elastic, fairly straight, and thinner than those of the Comstock; in fact, its leaves are often so thin and their veins so delicate that they can be used to make wrappers of fairly good quality. There is an objection to the Yamaska variety; it is very brittle and requires to be handled with the utmost care by expert workers. This is a defect, however, that might be remedied.

While the work of originating new varieties to meet the requirements of the cigar industry was going on, the methods of growing tobacco were also improved. In perfecting the making of semi-hotbeds without manure and bringing about their use an important advance was made. Hotbeds are always hard to construct

and operate properly; semi-hotbeds without manure, recommended by the Farnham Station, cost less, their construction and maintenance are easier, they are less subject to be invaded by diseases, they produce good, healthy plants, which do not suffer from transplanting and are less inclined to spindle than those grown in hotbeds.

Tobacco plants are attacked by several insects and diseases. By popularizing the use of poisoned bran and spraying with arsenate of lead, and by demonstrating the advantages of disinfecting the mould for the seed bed with formalin or sterilizing it by steam, much has been done to insure the success of tobacco growing.

The majority of the growers buy their manure in Montreal. This manure, however, is in great demand by vegetable gardeners and commands too high a price to-day to be used economically in tobacco growing. There is also another disadvantage: the growers cannot always get a sufficient quantity of it. Moreover, as the composition of manure cannot be changed, and as the quality of tobacco is easily affected by the quality of the manure, it would often be better to use less manure and to supplement it by the application of the necessary quantities of chemical fertilizers.

The first thing to do is to find the maximum formula of chemical fertilizers to use for the type of tobacco grown and the soil it is grown on. This is what the Farnham Station has been endeavouring to do by repeated experiments on thirty plots during the last four years. The soils of the Yamaska valley are losing their lime, a loss which is general throughout the province. Tobacco does not succeed on acid soils; but. on the other hand, an ill-advised application of lime would be followed by a deterioration in the suppleness and elasticity of the leaf. Over ten plots were used specially for the study of liming of tobacco soils.

The market for binder tobaccos is limited, and soon it will be necessary for our growers to seek new markets, if they go on increasing the number and the area of their tobacco fields. At the present time, the Province of Quebec produces practically no aromatic tobaccos (fillers) for cigars. The acclimatized varieties that might be used for the purpose do not yield enough to remunerate the grower; on the other hand, the large-yielding varieties which we have tried so far to acclimatize lose practically all their aroma. Two or three acclimatized varieties of Cuban, selected by the Tobacco Division and grown at the Farnham Station, give promise of keeping their aroma while retaining the qualities necessary to make good fillers. If we can manage to have the Canadian fillers accepted by the manufacturers, were it only for cheap cigars in the beginning, a market for two million more pounds of tobacco would be assured.

It would be impossible, in the space allotted to this article, to describe all the problems studied by the Farnham Station and show their importance. There are also many problems requiring careful study which have not yet been touched. These we hope soon to undertake with the co-operation of the growers of the district.

POTATO INSPECTION AND CERTIFICATION IN CANADA, 1922

By GEO. PARTRIDGE, Division of Botany

DURING the year 1922 the work of potato inspection and certification progressed along lines similar to those of previous years, a noticeable feature being a largely increased number of applications for inspection, with a consequent increase in the number of fields and acres inspected. Another noticeable feature has been an increased demand for our certified seed potatoes by growers in the United States. This is taken as an indication that Canadian-grown seed potatoes which measure up to the standards and are certified by inspectors of the Division of Botany, Experimental Farms Branch, Dominion Department of Agriculture, as to freedom from disease, varietal purity and trueness to type, have acquired a favourable reputation in many of the great potato growing districts to the south.

The Dominion system of inspection is carried on in all the provinces of Canada, with the exception of British Columbia, which maintains a provincial service conforming, however, to Dominion standards. During the past year, 3,283 fields, containing 11,250 acres, were inspected, and of these, 1,732 fields, containing 6,642¼ acres, passed both field inspections; an average of 52·8 and 59·0 respectively. The average amount of disease present in the fields which were accepted for certification, subject to tuber inspection, was: Blackleg ·47 per cent, Leaf Roll ·65 per cent, Mosaic 1·06 per cent, Wilts ·14 per cent. Tuber inspection of the crops from accepted fields is still in progress; up to the present date (December 21) 379,355 bushels have been certified.

Owing to the vastness of the area covered by this work, the attainment and maintenance of uniformity of methods has been one of our chief problems in the formulation of standards. It has been found necessary in past years to revise and adjust such standards, but, as a result of experience gained, definite and permanent standards have now been decided upon, and, commencing with next season, will be applied.

These, while not greatly varying from those previously applied, make provision for the combination of Leaf Roll, Curly Dwarf, Crinkle, Spindling Sprout and Streak, under the head of Leaf Roll, with a combined tolerance of six per cent; the proposed field inspection standard being as follows:—

Blackleg ....3 per cent.
Leaf Roll ......2 per cent.
(Curly Dwarf, etc.)
Mosaic ....2 per cent.
Wilts ....3 per cent.

Providing that in no case shall a total of more than six per cent be allowed.

At the time of the first field inspection it is usually found possible to determine the cause of "misses" in a field. When blackleg is found to be the cause, and the misses are numerous, the field is disqualified. When an inefficient planter is found to be the cause, and the field is otherwise up to standard, the grower is advised, in his own interest, to see that such a planter is put into proper shape.

There are also instances where unfavourable soil or climatic conditions are responsible for misses, the sets being suffocated or the sprouts unable to break through the surface; but as such conditions usually have the effect of rendering the whole field unhealthy in appearance and of sapping the vitality of the crop, the field cannot of course be accepted for certifi-

cation, however free from conditions produced by disease it may otherwise be.

For some years a column was contained in the field inspection reports for recording "Weak Plants." It was found, however, that this provided the inspectors with a weapon which was too obviously encouraging merely superficial inspection, the "Weak Plants" column being in some instances used far too freely. Some definite disease, or other condition, is responsible for weak plants, and it is important that such conditions be ascertained. The column in question was therefore eliminated.

The limit of tolerance of foreign varieties is one per cent, allowing, of course, in the event of the presence of a larger percentage, the grower to rogue his field, should he be willing to do so, between the first and second inspections.

Late Blight, Early Blight, Tip Burn and Insect Injury, are recorded in the field inspection report under the headings "Slight, Moderate and Severe." Since, generally speaking, these troubles may be kept from becoming severe by the frequent use of fungicides and insecticides, and since, in the case of the three latter troubles, a severe attack obviously affects the vitality of the crop—a severe attack of Late Blight being still more disastrous—any field severely affected by these troubles, and so listed in the field inspection report, is rejected.

A rather troublesome question which arises in connection with the maintenance of uniform field inspection standards is, "What importance should be attached to Rhizoctonia?" This trouble appears to be everywhere; in some parts to a negligible extent only, in other parts it is so severe in some years—as in Manitoba, parts of Saskatchewan and Alberta during the past year—that its effect upon the crop cannot be disregarded. Adjustment can of course be made in the application of the tuber inspection standards, in which ten per cent is allowed, but the crops from some of the fields referred to have been affected from 80 per cent to 100 per cent, which was a foregone conclusion, considering the conditions observed in these fields.

This trouble does not appear to be subject to control by seed treatment, particularly in the localities referred to. It would therefore seem to be of importance that investigation of Rhizoctonia should be made from other standpoints, such as soil, temperature, date of planting, date of digging, etc. In 1921 some evidence was obtained by Mr. Herbert Groh, of the Division of Botany, who was for some time acting as supervisor of potato inspection in Manitoba, which indicated that a low percentage of Rhizoctonia on the tubers was associated with immaturity of crop. This evidence was later supported by data secured through the courtesy of Dr. Bisby, at the Manitoba Agricultural College, from a series of tuber treatment experiments. Potatoes dug at successive dates, showed consistent increase of black scurf with each digging until the sixth, the seventh remaining practically the same at a figure so high as to leave little room for further increase.

Some attention has been paid during the past year, particularly in Nova Scotia, to isolation. Although no definite project has been worked out for the establishment of permanent isolation, fields of potatoes of the Garnet Chili variety—which variety is grown almost exclusively for shipment to Bermuda—will probably not be accepted next year for certification unless an attempt at isolation is in evidence.

During the past three or four years some valuable work has also

been done along this line by Mr. G. C. Cunningham, Plant Pathologist-in-Charge, at the laboratory at Fredericton, N.B., who has also acted as supervisor of inspection in that province. After several years' testing and experimental work, as a result of which he became convinced of the value of some specially selected strains of Green Mountains and Irish Cobblers, Mr. Cunningham was responsible for the multiplication of these strains and their general introduction into several important potato growing districts in New Brunswick. To-day these districts are practically community seed centres and are fast establishing a reputation for the excellence of the seed produced by them, to say nothing of the establishment of a profitable business.

Many districts of Prince Edward Island are also working towards community seed centres. With the introduction, some years ago, of some good strains of Irish Cobbler and Green Mountain potatoes into that province where formerly potatoes of white variety were not grown to any extent there came a revolution in seed potato growing. To-day, as the result of careful multiplication of the strains introduced, a large and ever-increasing supply of high-class seed of these two varieties is being produced, 89 per cent of which has this year measured up to the inspection standards. The attainment of these excellent results is aided and encouraged under the enthusiastic auspices of the Prince Edward Island Potato Growers' Association, which is very proud—and rightly so—of the progress made.

The following are the standards for tuber inspection:—

	Per Cent.
Bacterial Rot or Wilt.. ..	2
Late Blight and Dry Rot.	3
Common Scab and Rhizoctonia severe..	5
Powdery Scab..	1

Providing that in no case shall a total of more than 10 per cent be allowed.

Not more than two per cent of the tubers shall be off type or damaged by sunburn, cuts, cracks, bruises, insects, etc.

No tubers injured by frost shall be allowed.

Not more than five per cent by weight of the tubers shall be below three ounces or above twelve ounces

The headquarters of the inspection service are at the Central Experimental Farm, Ottawa. The service is under the direction of The Dominion Botanist, Mr. H. T. Güssow, with the writer in immediate charge. It was organized by the Dominion Botanist in 1915 on a small scale in Prince Edward Island and New Brunswick, and rapidly expanded until as stated above at the present time it is carried on in all the provinces from Prince Edward Island to Alberta.

It is now organized by provinces, with a supervisor in each province responsible to headquarters for the work of the number of permanent and temporary inspectors necessary to carry on the work to the best advantage. The supervisors in charge of the work in the various provinces are as follows:—

Province	*Name*	*Headquarters*
Prince Edward Island..	S. C. Peppin.	Charlottetown
Nova Scotia..	W. K. McCulloch.	Truro
New Brunswick..	G. C. Cunningham (acting)..	Fredericton
Quebec..	B. Baribeau..	Ste. Anne de la Pocatière
Ontario..	J. Tucker..	St. Catharines
Manitoba..	Vacant..	Winnipeg
Saskatchewan..	J. W. Scannell.	Saskatoon
Alberta..	H. S. MacLeod..	Saskatoon

PART II

Provincial Departments of Agriculture

THE ROYAL AGRICULTURAL WINTER FAIR, 1922

By R. W. WADE, Director, Live Stock Branch, Ontario Department of Agriculture

THE first Royal Agricultural Winter Fair was held in the new Coliseum, Exhibition Park, Toronto, from November 22 to 29, 1922. The exhibits were from every Province of the Dominion and from nine States of the American Union.

The following were the officers: President, W. A. Dryden, Brooklin; Vice-President, E. M. Carroll, Carls-Rite Hotel, Toronto; General Manager; A. P. Westervelt, York Building, Toronto. Executive Committee: J. D. Brien, Ridgetown; D. O. Bull, Brampton; F. C. Fletcher, Union Stock Yards, Toronto; Lt.-Col. Robt. McEwen, R.R. No. 4, London; E. H. Stonehouse, Weston.

The attendance amounted to 140,000 for the seven days. A complete analysis we believe would show that it was on an ascending scale, as the popularity of the Show seemed to increase from day to day, so that during the last few days, the arena, one of the largest in America, was hardly able to hold the visitors.

There have been many shows held on the American Continent, from speciality shows to world's fairs. It has, however, remained for this last new show to demonstrate what can be done when all factors for success are present, namely: accommodation for staging a show; a complete and generous prize list; active and efficient management; enthusiastic and progressive patrons and exhibitors.

The following table shows not only the diversity and range of the exhibits, but also the record number in most of the classes:—

TABLE SHOWING ENTRIES, BY PROVINCES AND FROM THE UNITED STATES IN THE VARIOUS DEPARTMENTS OF THE ROYAL WINTER FAIR

——	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	U.S.A.	Total
Horse Show	....	....	....	37	978	18	....	....	....	146	1,179
Breeding Horses	....	....	....	31	342	30	30	....	....	15	448
Beef Cattle	....	....	....	27	375	13	....	37	....	204	656
Market Cattle	....	1	....	....	123	5	....	20	....	25	174
Dairy Cattle	70	141	....	367	697	....	12	....	....	93	1,380
Milking Test	11	7	....	27	76	....	....	....	....	8	129
Clean Milk	3	1	....	4	11	....	....	....	....	1	20
Sheep and Wool	....	....	....	....	732	....	15	....	....	38	785
Swine	....	....	....	13	560	....	9	....	....	18	600
Foxes	325	4	16	43	52	....	....	....	....	4	444
Seeds and Potatoes	5	2	23	17	205	....	1	3	....	....	256
Poultry and Pet Stock	....	....	3	214	8,802	4	13	....	32	32	9,100
Dairy Products	....	6	4	7	340	26	10	29	....	....	422
Vegetables	....	....	3	....	449	....	....	....	....	....	452
Fruit	7	5	52	7	609	....	....	....	125	....	805
Flowers	....	....	....	....	107	....	....	....	....	....	107
Gold Fish	....	....	....	....	22	....	....	....	....	....	22
	421	167	101	794	14,480	96	90	89	157	584	16,979

The following table shows the comparative number of entries in the different departments at the leading shows and exhibitions:—

	Royal Agricultural Winter Fair, 1922	Canadian National Exhibition, 1921	Ontario Provincial Winter Fair, Guelph	International Exposition, Chicago, 1922	National Dairy Show, St. Paul, 1922	New York Horse Show, 1921	World's Fair, St. Louis, 1904	Panama-Pacific, 1915	Madison Square, N.Y., 1923	Boston, 1921	Standing of the Royal
Poultry	9,100	6,154	6,666				10,000	7,249	4,122	5,074	2
Dairy Cattle	1,380	632	146		826						1
Light Horses	1,311	153	141	?		1,617					2
Heavy Horses	316	205	257	731							2
Beef Cattle	830	613	387	2,305							2
Sheep	785	699	809	1,339							3
Swine	600	552	341	1,553							2
Student judging	221	318	264	100							3
Grain and Seeds	256	226	394	?							2
Dairy Test	149		90								1
Dairy Products	422	272									1
Foxes	444		14								1
Vegetables	452	357									1
Fruit	805	846									2
Flowers	107	208									2

NOTE:—We were unable to secure definite figures on the number o fentries under Light Horses, and Grain and Seeds, at the International Exposition, Chicago.

In glancing over the above table it will be noted that the Royal Show takes a commanding position in comparison with other shows of this continent, standing first in a large number of the sections, second in the remaining sections—with the exception of two cases where it is third to Chicago and Guelph in the number of sheep—and third to the Canadian National Exhibition and Guelph in the number of students judging. It has the proud distinction of having had more dairy cattle than the National Dairy Show, St. Paul:—

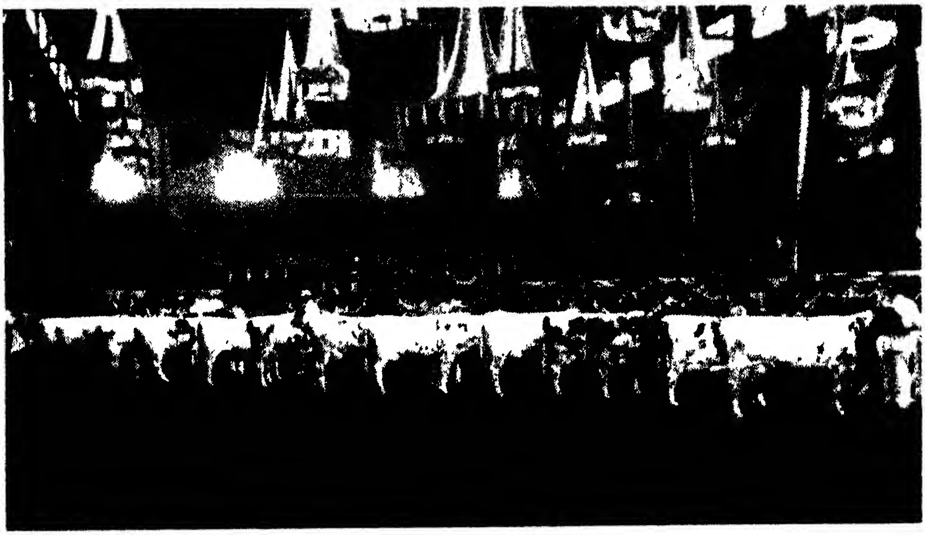
	National Dairy Show	Royal
Jerseys	128	210
Ayrshires	116	528
Brown Swiss	121	70
Guernseys	163	176
Holsteins	298	353
French Canadian	...	43
Total	826	1,380

In poultry there were more exhibits than at any of the great poultry shows of this continent, with the exception of the World's Fair, St. Louis, in 1904. It stood, as a light horse show, second only in numbers

to the New York Horse Show, with eighty per cent of the entries of the New York show. It was second to the International Exposition, Chicago, in Heavy Horses, Beef Cattle, Sheep and Swine. It should be borne in mind, however, that The Royal not only included the classes in which Chicago excels, but also had a record poultry show, an outstanding light horse show, and the largest dairy cattle show ever staged on this continent, as well as including a number of agricultural and horticultural displays, thus making it a very comprehensive exhibition.

One section should perhaps receive special notice, and that is the notable display of Black and Silver-Grey Foxes, exhibited from five of the nine Provinces, and a few from the United States.

The illustration showing the Ayrshire Cows being judged, will give some idea of the general appearance of the arena. It does not do it justice, however, as the proportions of the building, the tasteful decorations, the visitors in the galleries, sometimes to the number of 8,000, the excellent lighting effects in the evening, and the general harmony of colour, cannot be shown in a picture, but have to be seen to be appreciated.



Judging Aged Ayrshire Cows in Milk at the Royal Agricultural Winter Fair.

As an exhibition the first Royal Show has been highly successful. It has been one of the least costly and most effective means of advertising the agricultural development of the Dominion, and should prove a great inspiration to all people connected with the great industry of Agriculture. It received the heartiest support from farmers and stockmen; the closest co-operation from the various Departments of Agriculture, both Provincial and Dominion. With these factors working for the show in the future, it would appear to be an easy thing to prophesy a long, continued and successful career to the Royal Agricultural Winter Fair Association of Canada.

THE TEACHING OF AGRICULTURE AND DOMESTIC SCIENCE IN QUEBEC

By A. DESILETS, B.S.A., of the Quebec Department of Agriculture

I. THE BETTER FARMING TRAIN OF 1922

THE better farming train, organized by the Quebec Department of Agriculture and the Canadian Pacific Railway, started on its tour of the province of Quebec on September 18, 1922 It included sixteen cars of agricultural products, coming from the various districts of the province. The exhibits were placed in the following order:

(1) Grading of hogs; (2) Animals typical of the various breeds; (3) Feeding of live stock; (4) Dairy sires and bacon hogs; (5) Milch cows; (6) Live Stock judging; (7) Sheep and swine; (8) The dairying industry and co-operation; (9) Field crops; (10) Rural engineering and farm buildings; (11) Horticulture and fruit trees; (12) Poultry-keeping; (13) Bee-keeping and maple sugar; (14) Home industries; (15) Administration and management; (16) Miscellaneous advice and housing.

The Agricultural Train in Quebec drew crowds of interested visitors at each stopping place.

One of the objects in view in arranging for this train was that the Hon. J. E. Caron, provincial Minister of Agriculture, wanted to bring before the general public, in town and country alike, conclusive proof of the fact that the products of our land, of our herds and flocks, as well as of our home industries—due to the scientific methods taught by the various branches of the Department—are fully equal to the products of other provinces, and even superior in some instances.

Practical lessons were given each day, starting at 10 a.m. and finishing at 10 p.m., by twenty experts on agriculture and domestic science. This train made thirty-nine stops on the Canadian Pacific Railway lines in

the province, and the total attendance was over 145,600.

A similar train had been run on the Intercolonial railway in 1911-12; the attendance at that time was about 16 per cent of that of 1922. This increase is a striking proof of the progress made by agriculture in the province of Quebec during the last ten years.

II. Courses in Agriculture and Domestic Science 1923

The short courses inaugurated in 1915 are held each year during three or four months of the season. This year, the districts of Chicoutimi, lake St-Jean, Charlevoix and Montmorency will be covered by some eighteen instructors. Three sessions will be held each day in thirty-six localities by these travelling colleges, fully equipped with demonstration material and three moving-picture machines.

Notwithstanding unusual difficulties this season, the average attendance at these courses was over 400

Each year, before starting on these series of courses, the instructors make a thorough survey of local agricultural conditions, noting the possibilities of development or of the establishment of new industries. This opportunity of securing information is welcomed by the farmers, who are always ready to discuss their many problems with these agricultural missionaries, who place their knowledge at the farmers' disposal.

III. Women's Organizations

The women's organizations are certainly one of the most efficient factors in the agricultural progress of the province. If the mother of the family can be made to love her home, the land, it may be taken for granted that the husband and the children will be faithful to agriculture. The women's clubs and the women's institutes, of which there are 114 at present, count more than 7,000 members receiving technical instruction from the Quebec Department of Agriculture. Such clubs, by study and practical work, develop horticulture, bee-keeping, poultry-keeping, and reestablish domestic textile industries of linens and woollens. They also adopt our methods of agricultural and home book-keeping and encourage the use of the same in their districts. Such organizations help to complete, in a rational and efficient manner, the information given to the students of our domestic science schools.

Agriculture and domestic science in these clubs are taught by seven instructors—of whom five are women —who visit the clubs by turn and regularly. By means of demonstrations and special courses, the instructors teach the knowledge necessary to the mistress of the house in maintaining a proper equilibrium between the production of food and its consumption.

The instructors show how gardening may be made to pay, as well as bee-keeping and poultry-keeping All the clubs are now using the spinning-wheel and the loom, and the many exhibits at the annual fairs are convincing evidence of the enthusiasm with which the French-Canadian women have resumed the making of linens, cloth, woollens, carpets, laces, etc., for which they were justly famous in the past. Our women apply themselves in an assiduous manner to the rational and economical management of their homes and to the moral and physical training of their children.

THE AGRICULTURAL INSTRUCTION ACT AND ITS EFFECT ON RURAL CITIZENSHIP IN MANITOBA

By S. T. NEWTON, Superintendent Extension Service

POSSIBLY no single act of parliament has had a greater influence on rural citizenship in Manitoba than the Agricultural Instruction Act.

In Manitoba it was assumed that the purpose of the Act was to provide for people living in the country, whose business did not permit them to attend an agricultural college for any considerable length of time, some of the instruction provided at the college. In order to carry on the work with a maximum efficiency and a minimum of expense, the Agricultural Extension Service was organized.

As far as possible, existing organizations were made use of as the connecting link between the Department of Agriculture, the Agricultural College, and the Experimental Farms, on the one hand, and the people living in the country, on the other. The Agricultural Society was already in existence, and has always been ready to co-operate in any line of effort tending toward the improvement of rural conditions, but for women's work there was no organization, and one of the first steps taken was to organize Home Economics Societies, later known as Women's Institutes. Shortly after came the organization of Grain Growers' locals, and later United Farm Women's locals, and these organizations have also shown a very friendly spirit of co-operation. Boys' and Girls' Clubs in connection with the public schools were organized for the purpose of carrying on junior extension work. At the present time we have 70 Agricultural Societies, 140 Women's Institutes, 420 U.F.M., 97 U.F.W.M. organizations, and 215 Boys' and Girls' Clubs with over 1,700 branches.

Extension Work for Men

During the ten years that the Act has been in operation, over 200 short courses, ranging from five to ten days in length, have been held with a total enrolment of over 8,000; and 1,520 community meetings with an attendance of over 114,000. Seventy per cent of the community meetings were held in the newer settled districts and in the new-Canadian settlements, and visits paid to these districts by lecturers in succeeding years gave ample evidence that the information given, and the numerous questions answered by the lecturers had been of great benefit in the improvement of farming methods.

Extension Work for Women

The short courses in clothing work and the lecture demonstrations in foods have been continued from 1915 until the present without any apparent lack of interest. As a general rule, the short courses in clothing have continued over a period of four and one-half days, and the total number of courses held was 1,850, with a total enrolment of 25,900 and an aggregate attendance of 256,000, which means that over 300,000 garments or hats were made, and the instructors, who have been with the Extension Service during the greater part of that time, assure us that the same kind of garment only requires half as long to make now as it took when the short courses were first organized. Not the least of the benefits of the short course was the bringing together of a number of women, who, after working together for a week, get to know each other better and to appreciate each other's good qualities more. In

foods the instruction given during the earlier years that the Act was in operation consisted of demonstration lectures on the preparation of the various kinds of food, and the canning of vegetables, fruit and meats. More recently the tendency has been to emphasize food values.

Throughout the entire period assistance was given in organizing Women's Institutes and in assisting them to prepare yearly programmes. Altogether, over 600 lectures or addresses were given and the aggregate attendance was close to 30,000.

Boys' and Girls' Clubs

As the purpose of extension work was to provide a programme for the whole family, the boys and girls were not forgotten. At the beginning a few independent clubs were organized, but it was soon found that in order to prevent duplication of effort the best plan was to co-operate with the school inspectors and teachers, and this plan has continued to be very satisfactory, both from the standpoint of the Department of Agriculture and the Department of Education, and what is of much more importance, to the boys and girls themselves. Club work has extended even to the schools located at the outposts of settlement, and at the present time over 1,700 schools are connected with the boys' and girls' club organization, and the 205 central club fairs at which are exhibited the live stock, chickens, vegetables, grain, needlework, cookery, canning, school work, etc., are each the big community event of the season and have induced hundreds of thousands of boys and girls to take a keener interest in home and farm life. "Hundreds of thousands" is used advisedly for the membership in clubs ranged from 750 in 1913 to 35,000 in 1922.

Through demonstration team work, some splendid oratorical ability has been developed, and it is not unusual to find a " teen-age " girl get up on a public platform and give a more finished demonstration lecture than was possible for a grown-up ten years ago.

Through the co-operation of several commercial organizations, over 1,000 boys and girls have been given a trip to Winnipeg, and with it a week of instruction, sight-seeing and entertainment, which has served not only to widen their vision but to bring city and country closer together in understanding and appreciation

The boys' and girls' clubs supplement the work of the Agricultural and Horticultural Societies in an admirable manner, for whereas these societies have as their principal object the improvement of live stock and the products of the field, garden and kitchen, the clubs have as their chief aim the development of industrious, ambitious boys and girls who are feeding live stock and chickens, raising grains and vegetables, making garments, bread and butter, etc., because they love this kind of work and are incidentally learning better methods and practices in Agriculture and Homemaking.

The motion picture machine, with instructive films on Agriculture and Home Economics, has pushed back 45 miles from the railroads to the great delight of hundreds who had never seen a " movie." Lectures on agriculture and pictures alternated at the meetings and seemed to be received with equal appreciation and enthusiasm.

Beekeeping

Another phase of extension work which has shown great development is the bee-keeping industry. During the last year alone the number of beekeepers has doubled, and it has been found that Manitoba has enormous resources in the shape of honey-bearing plants which have enabled

the beekeepers to produce 1,800,000 pounds of honey during the year, an average of 133 pounds per hive.

The Future

Good work has already been done, and there is much that might be done. In addition to the splendid financial assistance provided under the Act, we believe that even better results could be obtained if the Federal Government could provide a few experts to co-operate with extension agencies in the various provinces. For instance, Agricultural Representative work is now carried on to a certain extent in each province. A federal officer who could spend a week in conference with the representatives in each province would be a means of bringing to each conference many valuable suggestions; and the same would be true of boys' and girls' club work, home economics, etc.

THE RECONSTRUCTION OF ALBERTA'S DAIRY INDUSTRY

An Account of the First Year's Experience under Government Cream Grading

RECONSTRUCTION is a word that has come into familiar use since the world war. It is a word that might aptly be applied to what has been going on with respect to the dairy industry in the province of Alberta within the past year. The recovery and retention of quality markets for Alberta butter, in other words, has been a problem receiving the serious attention of all the interests concerned in the industry in that province.

In the years before the war, when Alberta was making rapid strides in all phases of development, the province, due to its great natural advantages, and to the fostering of the dairy industry by a highly competent dairy branch of the department of agriculture, very quickly established itself as one of the premier provinces of the Dominion in the production of dairy products of a high quality.

But the war brought its economic changes. It is a well known fact that the war years developed conditions in connection with the food supply of the world, which laid strong temporary emphasis upon the necessity of increased production of food products. These conditions led to the establishment of comparatively high price levels and a narrowing of the customary spread in prices in favour of quality products. This was a world condition and affected very largely the manufactured products of an animal origin, including dairy products. In the period of reconstruction following the war, it became imperative for the various industries to take stock of their ability not only to re-establish their former trade connections, but also to secure new outlets for the speedily increasing volume of production of such commodities as could be produced to best advantage.

Alberta, in company with other provinces, soon realized the result of conditions created by the war, particularly with respect to its dairy industry. In the year 1917, Alberta butter had reached a high pinnacle of quality. Of the total amount of butter graded in the season of 1917, by government graders, 56 per cent reached the "special" class. From that point, however, deterioration in grade began to set in. From 1917 to 1921 the percentage of special grade

butter dropped from 56 per cent to 7·7 per cent, while percentage of "firsts" increased from 36·3 per cent to 66·7 per cent, and the percentage of seconds increased from 6·7 per cent to 24·7 per cent.

This was the situation when, at the beginning of 1922 those concerned decided that steps were necessary to bring the industry back to its previous high status, and to set it once more upon the road to ultimate and permanent prosperity. There was no doubt about the ability of Alberta to stage a "come-back" in this regard. The forward strides the industry had been making had been halted by conditions arising out of the war, and an actual retrograde movement had set in. This condition was not confined to Alberta, and other provinces were beginning to take reconstructive steps. Officials in Alberta frankly faced the situation. The question was, where did the chief responsibility for neglect of quality lie, and what were the steps most advisable to take?

Figures produced by the dairy commissioner served to show that to a large extent responsibility for deterioration in grade rested with the producer. Out of a total of 7,852 churnings graded in 1921, 50 per cent showed more or less stale cream flavour. The creameries had little to do with this, save wherein they failed to express grades. The fault lay in the quality. But while no doubt the producer was primarily responsible for this condition, the system of cream buying stations which has sprung up in the past few years fostered neglect of quality. The element of local competition became a strong factor, and producers of high quality cream often found themselves getting no more for their product than producers of low grade cream.

Under this condition of affairs, many cream producers became imbued with the notion that once they had disposed of their cream to the local cream buyer their interests ceased. Perhaps they had obtained a relatively good price for their cream, irrespective of quality, and they departed satisfied. But that was only a temporary advantage. The road to continued success is longer than that. It stretches right down to the door of that discriminating personage, the ultimate consumer, and nothing but the best will suit him. The marketing of a quantity of low grade cream very soon finds its reflection in a lower standard of butter, and a consequent falling off in price for cream. This is exactly what had been happening in Alberta.

In a review of the situation, it became obvious that the elimination of the cream-buying stations would be a long step toward the objective of improved quality and better prices for the producer. Other western provinces had eliminated this system, and reported most satisfactory results. But a still further step was also thought advisable, namely, the establishment of government grading of cream, a step which had not hitherto been taken by any government.

Thus it was that, after consultation with the representative dairy interests, and strong recommendations from those interests and from officials of his department, Hon. Geo. Hoadley, minister of agriculture, introduced at the session of 1922, legislation putting into effect the elimination of the cream stations and taking the steps necessary to put government cream grading into effect.

The great object sought in the elimination of the cream stations was to clear the channel, to straighten out the line, between the producer of quality cream and the market for quality butter. In other words, it sought to establish conditions under which the farmer who took the trouble to put the quality into his cream—and certainly no one else

could put it there—would get the full benefit of his efforts by reaching the best markets available and getting the price for his product that he was entitled to.

This would be accomplished, the department believed, by the elimination of the cream-buying stations, which would result in the shipment of cream direct to creameries, and by the establishment of a system of government grading at the manufacturing points.

Bringing the question down to a matter of dollars and cents, what was to be the direct benefit of the new system? In the first place, it was estimated that the direct saving to the industry would alone constitute a very large item. It was stated that the old system of cream-buying stations cost the industry $250,000 annually. The new system of restricted service at local points which is permitted under the amendments, should not cost more than $50,000, it was estimated. In addition to this, the legislature voted $40,000 for government grading. This made a total under the new system of $90,000, or approximately $100,000. If these figures were eventually borne out, it would result in a direct saving of $150,000 a year.

Furthermore, the improvement in quality under the new system would result, the dairy commissioner confidently believed, in increased revenue of $150,000 in the first year. This improvement would increase and be cumulative from year to year, increasing the amount of revenue to the industry and resulting in the securing and holding of quality markets for Alberta butter.

The new system went into effect on May 1, 1922. It required no more than six months' experience to prove beyond the possibility of doubt that the claims made for the new scheme had been justified. Much of what was hoped would be accomplished in a year has been accomplished in half of that time, and figures have been presented to the Minister of Agriculture by the dairy commissioner which prove conclusively that direct returns to the producer have been much greater than anticipated.

The following table shows not only how the deterioration in grade has been checked, but how the improvement in grade has been such that the product will, before long, have climbed again to the status of 1917:

	1921	1922
Butter graded, May to October (lbs.)..	5,680,015	6,204,573
"Special" grade..	8.0%	26.8%
"First" grade, flavour score 40 points..	30.1%	35.0%
"First" grade, flavour score 39 points	35.8%	19.0%
"Second" grade, flavour score 38 points..	19.1%	13.7%
"Second" grade, flavour score 37 points..	6.0%	4.2%
Off grade..	1.0%	1.3%
	100.0%	100.0%

So much for the improvement of the quality of the butter. What has been the direct benefit to the producer in dollars and cents? During the six months from May 1 to October 31, the government graders stationed at the 46 creameries in the province classified cream containing over nine million pounds of butterfat. In spite of the fact that during this time the general market for creamery butter was approximately one cent per pound lower than that of 1921, and after making due allowance for this fact, the cream producers received nearly two cents more per pound butterfat, direct shipment basis, for special grade cream; and those who disposed of their cream last year on a cream station basis, this year received six cents more per pound butterfat. This means that during these six months the creameries have paid the producers at least $250,000 more for their butterfat than last year, with the cream stations in operation, and more than justified the claim made

last May that the new system would effect a yearly saving of $150,000 to the dairy industry. Generous praise is due the creamery operators of the province for loyally carrying out their part in this practical demonstration of "vertical" co-operation, and also to the thousands of farmers who realized the situation and responded to the call for quality production.

So much for the direct financial benefits. But there is the larger view, the vision of what this form of co-operation can be made to do for the future of our dairy industry, in the re-establishment of Alberta butter as the desirable product in the best available markets, and in the stabilizing of dairying as one of the province's important and growing industries.

Alberta creamery butter production for 1922 will exceed 15,000,000 pounds, an increase of over two million pounds over 1921. It will be seen by this that the problem of finding and holding remunerative markets for the surplus is by no means diminishing, and with the increasing production there is the increasing necessity for quality production and team work to that end.

MEETING THE FARMERS' FERTILIZER NEEDS HALF-WAY

How the New Brunswick Department of Agriculture Helps the Farmer to Procure Cheaper Fertilizers

By O. C. HICKS, B.S.A., Superintendent of Soils and Crops

JUST as the Legislature of the Province of New Brunswick was the first governing body of any of the Canadian Provinces to institute a soil survey, undertaken in 1849 by Professor Johnston, F.R.G.S., to disclose the agricultural capabilities of the country, so, it was the first Provincial Legislature to introduce, three generations later, legislation for the conservation of the crop-producing power of the soil.

An Act, significant in the annals of state measures for the development and utilization of natural resources, was passed in 1920 by the New Brunswick Legislature authorizing the Minister of Agriculture to purchase a limestone deposit, a manufacturing plant and machinery, and to make agreement for manufacturing and preparing agricultural lime. This Act was the culmination of a demand which had arisen among the farmers of the Province for crushed limestone to be used as a fertilizer to renew the virgin productivity of their farms, and to accomplish this result at a minimum cost.

The extent to which the practice of liming with pulverized limestone developed and the wonderful results of its generous application, surpassed the expectations of the sponsors and supporters of the scheme. The low price at which the product is offered under contract with the operators and the reduced freight-rate conceded by the Railway Commission of Canada, places an economical method of soil enrichment within the reach of every farmer whose wagon haul from railway station to farm does not exceed five miles.

Appreciation of the facility for securing lime is shown by the patronage extended to the Government plant, situated at Brookville on the Canadian National Railway System, near St. John City, during the two years since the plant began operations. The total output to date, close

of fiscal year 1922, was thirteen thousand tons. This quantity was used to fertilize several thousand acres planted to wheat, oats, turnips and potatoes. During the rush season preceding the commencement of spring seeding operations a maximum monthly output of one thousand seven hundred tons was attained. Shipment was made mostly in bulk, carlots, at the contract price of three dollars a ton; though bagged lots formed no small proportion of the output except during the rush period.

To say that every acre to which limestone is applied will produce as well as though a high grade commercial fertilizer were used, and that the difference in cost of these two materials is a clear saving, would be "drawing the long-bow" on fact. Yet, so remarkable are the effects of pulverized limestone, that many farmers who have invested the price of one ton of high-grade commercial fertilizer in a carload of lime, have changed their former practice of "fertilizing" to "liming"

Testimonies in appreciation of liming generally state, in terms of increased bushels or tons, a comparison of its use on treated fields with untreated fields. Those quoted, however, are sufficiently novel to illustrate facts which augur well for a more widespread use of raw pulverized lime-rock. An experienced farmer wrote as follows:—

"I have used several carloads of pulverized limestone and I would not farm without it when it can be obtained. I have no experience in potato culture but for wheat, oats, barley and especially on hay and clover; it cannot be beaten."

Another, who had used mussel mud and commercial fertilizers but who now depends on lime, wrote:

"I had used the lime in small quantities for two or three years with good results. Last spring I bought a carload and, although the freight cost almost as much as the lime, I consider I am well repaid for the money invested, for it is the most profitable fertilizer I ever bought."

Still another wrote:

"I wish to say that the results have been more than I had any idea of. Last year, notwithstanding the very dry season, the grain crop was very good and was admired by all who saw it. This year I got a wonderful crop of hay early in the season. The last of August there was a second fine crop of clover. At the present time (October 1, 1922) I am cutting a third crop of clover hay this season. It was nothing else but the lime which made such a thing possible."

Not only have the fertilizer needs of those farmers having a low railway transportation rate and a short wagon haul been met by cheap lime, but those also whose farms are near the estuaries of rivers or coastal waters where there are extensive and easily worked beds of shell-marl To encourage liming with marl, a bonus to defray in part the cost of a dredge or other digging appliance, is available by Statute. Many thousands of tons of shell-marl are annually procured along the shores of the coastal counties, and much of the agricultural wealth of these sections can be traced to this beneficent legislation whereby the riches of the sea are returned to the land in the form of a crop fertilizer.

It is true that cheap lime meets the farmers' fertilizer needs only in a figurative way. In a more literal manner these needs have been met by legislation that has aimed to provide him with a means to secure cheaper chemical fertilizers through co-operative purchasing by farmer organizations. Corporate powers

were conferred upon a central organization of the Agricultural Societies, in 1914, to purchase fertilizing ingredients, and to arrange for the importation, warehousing and distribution of the same to any agricultural society. Since that time an average of over one thousand tons of fertilizer chemicals has been distributed to farmers annually by the New Brunswick Agricultural Societies United, at a saving of twenty-five per cent on the price of the factory-mixed brands.

Government demonstration work by district Agricultural Representatives in the home-mixing of fertilizer chemicals, the compounding of fertilizer formulæ, and comparative test applications of home-mixed and factory-mixed grades have contributed not a little to the education of the farmer on the whole subject of commercial fertilizers.

Concern for the production of the food supply of present and future generations is evinced by those in high authority in all civilized countries. Many and varied are the safeguards by which governments have sought to attain to a condition where abundant food supplies, the product of a flourishing home agriculture, would be perpetually assured. To this end various countries jealously guard such mineral deposits and other sources of materials as are useful in agriculture as fertilizers. Germany and Chili levy royalties on the export of potash and nitrate salts respectively. So marked was the concern of the United States authorities for the preservation of the fertility of the soil that, at a conference of the States' Governors at Washington in 1908, it was suggested that a law should be passed prohibiting the export of phosphates to foreign countries.

All States and Dominions exercise a parental control over the fertilizer trade in the interest of the consumer, and all make generous appropriations for scientific research directed to discover new sources of fertilizing materials, and to conduct cultural experiments to determine the utility and effects of fertilizers. Effective as are the tendencies of such measures towards keeping a reserve of plant food for the future and in promulgating information for its wise and economical use, the positive action of such policies by which the farmer profits because of cheap fertilizer, is obscured. But the wisdom and discernment of the policy of the New Brunswick Government of providing manufactured limestone to the farmers of a province is unique among the methods of government aid to maintain soil fertility.

The very practical form of governmental cooperation and aid to meet the farmers' need for cheaper fertilizer in this Province can justly be claimed to have been successful in grappling with the problem of perpetuating the soil's power to produce profitable crops.

PROVINCIAL POTATO FAIR

By J. B. MUNRO, B.S.A., Soil and Crop Instructor

SOME idea of the importance of the potato industry in British Columbia may be gathered from the success of the recent Potato Fair held in Grand Forks, B.C. This is the first fair devoted completely to potatoes and potato products in British Columbia. It was held by authority of the Honourable the Minister of Agriculture under the direction of Cecil Tice, Provincial Potato Specialist, with the assistance

and co-operation of the Grand Forks Board of Trade and various local organizations. The exhibits included over two hundred individual entries of commercial and seed potatoes, nine entries of commercial potatoes in sacks, seven district displays each composed of eight individual lots and seven displays of dishes prepared from potatoes. More than seventy boys and girls, pupils of the Grand Forks schools, entered in the potato-judging competition held in connection with the fair.

Every part of British Columbia was represented at the Potato Fair. Entries from the main line of the Grand Trunk Pacific Railway, from Vancouver Island, the Lower Mainland, and the several valleys of the Interior were assembled in competition. The district displays were mainly from sections where certified seed work is being conducted by the Provincial Department of Agriculture

It is interesting to note the number of prize-winners and average score in commercial seed and district potato displays by those districts sending the largest number of exhibits to the fair.

Windermere: Exhibits, 29; prize-winners, 20; average score, 96 4.

Courtenay: Exhibits, 33; prize-winners, 20; average score, 95 4.

Chilliwack: Exhibits, 32; prize-winners, 13; average score, 93 2.

Grand Forks: Exhibits, 33; prize-winners, 3; average score, 92·2.

The growth of potato work in British Columbia may be judged from the fact that in 1921 only eight lots of potatoes were shown at the Potato Fair held in Victoria in connection with the Provincial Seed Fair, and in February, 1922, at Chilliwack ninety-seven entries were made at the fair held in connection with the Dairymen's Convention. Upwards of three hundred lots of potatoes were shown at the recent exhibition.

The prize list was large and included classes for certified seed, uncertified seed, commercial potatoes, boys and girls exhibits, cooked potato dishes, commercial sacks of potatoes and district displays. Three silver cups were among the special awards as well as two potato graders, potato sprayers and other valuable pieces of equipment for the potato grower.

Conferences for potato growers were held in the afternoon and evening of three days of the fair and addresses were delivered by prominent officials of the Federal and Provincial Departments of Agriculture, the University of British Columbia and by Professor Hungerford of the University of Moscow, Idaho.

The growing of certified seed has been established in several of the best districts of the Province. The estimated production this year will be in the neighbourhood of 10,000 bushels, all of which will find a ready market in the Province. Growers of commercial stock have come to the conclusion that best results and highest yields are obtained through the use of certified seed potatoes. This year the growers have set their prices for spring delivery at $2.50 per cwt. or $40 a ton f.o.b. shipping points, and buyers are quite willing to pay this price for the seed.

At present a great many varieties of potatoes are being grown in British Columbia but the number is gradually being reduced. In using certified seed only varieties best suited to the districts are advocated and these standard varieties are gradually being adopted to the exclusion of many of the less valuable kinds.

PART III

Agricultural Education and Related Activities

SASKATCHEWAN BOYS' AND GIRLS' CLUBS

By FRED W. BATES, B.A., M.Sc., Director of Rural Education Associations, and HARRY SAVILLE, B.S.A., Organizer of Boys' and Girls' Clubs

ARTICLES dealing with the aim and progress of elementary agricultural instruction in Saskatchewan have appeared from time to time in the *Agricultural Gazette*. In the last number for 1922, the school phase of the work was discussed while a previous number contained a short article on the school exhibition and related activities. It is the purpose of this article to show the place and development of one of these related activities, viz., Boys' and Girls' Clubs.

Club work in Saskatchewan has developed along lines somewhat different from that obtaining elsewhere as it has grown from within the school outward rather than *vice versa*. The first school exhibitions consisted of work done in school or on the school grounds. With the spread of the movement came a natural demand for special contests in home activities such as pig raising, poultry raising, potato growing. At first these consisted merely of exhibits, but soon the necessity for more careful direction became evident, resulting in the development of regulations which made it necessary for the contestants to actually care for and in some cases own the exhibit.

The first steps in organized club activities were taken in 1916 when the Rural Education Associations of the Weyburn Inspectorate arranged contests in the "Raising and Feeding of Swine, Sheep, etc.," which were open to "boys and girls up to eighteen years of age" living in the territory covered by the association. In 1918 the possibilities of this type of work became so apparent and the need for guidance so pressing that the College of Agriculture appointed an assistant to the Director of Extension who should devote his time to the promotion of club activities. In 1920 this phase of work was transferred to the Department of Education in order that it might be linked up more closely with the school exhibition system of the province. Since then the interest in this type of work has continually increased, although the financial situation has during the past year prevented the expansion that had been hoped for.

Since the Boys' and Girls' Clubs in Saskatchewan are under the direction of the Department of Education, the main emphasis is placed on the educational rather than the economic phases of the work. The club is an organization of young people based on the principle that education should be related to the life of the community. Educational activities carried on by children should consist not only of the traditional class-room subjects, but also of those subjects such as agriculture, nature study, gardening, household science, manual training, and public speaking, which have a more direct bearing upon the home life. Boys' and Girls' Clubs aim to show (1) How important these are in our lives, (2) How interesting they are if approached in a proper manner, (3) How they may be taught and conducted in the best way. The ultimate purpose of club work is to provide opportunity for

the full expression of the natural talents of the boy or girl under direction that will foster their expansion to life's highest fulfilment.

The question is often raised as to the difference between the contests of the school exhibition and club contests. Strictly speaking, the school exhibition is simply an exhibition of the work of all grades in the class-room and of work done outside the class-room, such as school gardening, which is an integral part of the school work. It is primarily an exhibition of the work of all pupils attending school, but has also included other activities such as stock raising and grain growing. The club differs from this in that it enrolls only boys and girls of the ages 10 to 18. It aims to reach all boys and girls of these ages, whether attending school or not.

The school exhibition provides for a "competition," but club work is a "project." The latter calls for sustained effort covering several weeks and the exhibition or competition is merely the climax coming at the completion of the project. Very many boys and girls leave school at an early age and will not return; the club contests maintain their interest in young people's activities and provide an opportunity for the school to maintain its hold on them; especially is this so where the school and club fairs are held jointly.

While in isolated cases club work may necessarily require to be carried on independently, experience has shown that the best results are achieved when it is developed under the auspices of some live existing community organization. The Rural Education Association has so far proven the most successful in developing this type of work although in many cases the School Exhibition Association has fulfilled the same function. Frequently the Agricultural Society or the Homemakers' Club has accomplished very satisfactory results. Every effort is put forth to use existing agencies in order to avoid duplication and prevent any unnecessary increase in community organization.

The amount of territory covered by a Club depends to some extent upon that served by the parent organization. It usually corresponds with that embraced by the school exhibition and seldom has a radius of more than ten miles. Each school district within the organization constitutes a "branch" of the Club and any boy or girl residing in the territory, whether attending school or not, may become a member.

When the Club is conducted as an activity of a Rural Education Association or other existing organization, the board of directors of the parent organization is the governing body. A club committee is appointed including a secretary-manager and branch leaders to guide in the various activities Upon the enrolment of the boys and girls as club members, those resident in each school district form themselves into a branch club with officers selected from among themselves, and regular meetings are held. The club committee determines the projects to be undertaken, raises the necessary funds and in general directs the work.

While there is no restriction in the number of projects to be taken up by any member, an endeavour is made not to overload the individual. This also facilitates supervision and makes competition more keen. The following projects are recommended—

(1) Calf Raising.
(2) Pig Raising.
(3) Sheep Raising.
(4) Colt Training.
(5) Poultry Raising.
(6) Potato Growing.
(7) Gardening.
(8) Canning.
(9) Stock Judging.

(10) Grain Growing and Judging.
(11) Field Corn Growing.
(12) Cow Testing.
(13) Nature Study.
(14) Literary.

The Department provides bulletins and other forms of literature while the organizer advises the clubs and makes as many personal visits as possible. At fair time at least one outside judge is provided. During the season canning demonstrations and stock-judging courses are arranged. No assistance is given by way of grants, all financing being done locally.

During 1922 there were 54 clubs in operation with 140 branches having a membership of 2,537, of which 1,330 were boys and 1,207 girls. The projects engaged in were as follows—

	Calf Raising	Pig Raising	Sheep Raising	Colt Training	Poultry Raising	Grain Growing	Corn Growing	Potato Growing
Boys...	212	157	41	95	410	171	123	447
Girls...	66	49	7	17	366	77	90	251
	278	206	48	112	776	248	213	698

	Gardening	Canning	Stock Judging	Cow Testing	Nature Study	Literary	Others	Total
Boys..........	614	64	213	11	168	112	154	2,992
Girls..........	624	484	35	0	215	163	231	2,675
	1,238	548	248	11	383	275	385	5,667

As all club work is financed locally, it will readily be understood that financial conditions seriously affect its development. The year just ended has been one of serious stringency throughout the greater part of the province; consequently the increase in club activities which had been hoped for did not materialize. Many centres suspended all lines of effort not absolutely necessary but are laying plans to resume activity the coming season. The interest in junior work of every phase is steadily growing and the value of directed effort is becoming more and more appreciated. We are looking forward to 1923 as our best year and are planning to make the club work of even greater value than it has been in the past.

THE SASKATCHEWAN FARM BOYS' CAMPS—WHAT THEY ARE, AND HOW THEY SERVE THE BOYS OF THE PROVINCE

By K. W. GORDON, Assistant Director of Agricultural Extension, University of Saskatchewan

ABOUT eight years ago, the late Lieutenant H. N. Thompson, then Weed and Seed Commissioner for Saskatchewan, conceived the thought of gathering together as large a number as possible of farm boys every year, in order to show them the best in live stock and farm produce that their province could produce and instil in their receptive and developing minds the ideal of being able some day to equal or even excel the best when they become managers of their own farms.

The result was that in 1915, the first Saskatchewan Farm Boys' Camp was organized at Regina through the co-operation of the Regina Fair Board. For four years the camp grew and prospered and became one of the biggest events at the Regina Fair. In 1919, the number of applications received from Agricultural Societies desiring to send teams was so great that it was found impossible to conduct the camp as one group, and with the co-operation of the Saskatoon Exhibition Board, who were as hearty in their endeavour to assist as Regina had been, two camps were held, namely, one during Regina Fair week and one while Saskatoon was holding its exhibition.

Since the camp movement started, over 2,500 boys have attended camp, either at Regina or Saskatoon, and have come under the influence of the best in agriculture that the province can produce.

The boys that attend camp consist of teams of five boys between the ages of fourteen and seventeen years, accompanied by an adult supervisor. They represent one of the hundred and fifty Agricultural Societies which are distributed all over the province

The Agricultural Societies are at present the only organizations that have the privilege of making application to send teams to either camp These teams are selected in various ways, but the most common practice is for the Society to have all boys of required age take part in a local stock-judging competition. The reward for each of the five boys making the highest standing is to become a member of the team representing their society and to have a free trip to either Regina or Saskatoon.

The main feature of the camp is educational, and, in a secondary way, inspirational. In 1919, when it was planned to have annually two camps in the province, it was arranged to make them form a complete agricultural course. In Regina, the boys are known as Juniors. They have not previously attended a camp, and should be between the ages of fourteen and sixteen years. The main educational features in the programme are lectures and demonstrations in judging heavy horses, beef cattle, dairy cattle, and bacon hogs, and competitions in judging these types of animals are held. Four outstanding and typical specimens of each of the above mentioned types are chosen as a class to be judged. It is felt that having these boys examine, handle and judge these outstanding animals cannot help but leave a deep impression on their minds as to what a really good animal should look like. At Saskatoon, the boys are known as Seniors. They should be fifteen to seventeen years of age, and should have previously attended the Regina Camp. The only stock judging conducted in Saskatoon is in mutton sheep. There are, however, lectures on field husbandry subjects, and competitions in judging grain and identifying crops, weeds and weed seeds The grain-judging is to teach the boys how to select good seed. The competition in identifying crops brings to their notice new types of forage crops and new varieties of cereals. The weed work impresses them with the importance of weed control and makes them familiar with common weeds as seen in threshed grain or in the fields. In the contests at both fairs, the boys compete as individuals and as teams. A fifty dollar scholarship is offered to each of the boys winning the first place in the different competitions, and a seventy-five dollar scholarship to the boy having the highest total aggregate. These scholarships are tenable at the Saskatchewan Agricultural College. Books dealing with live stock and farm crops are also

given to each member of the group standing first as a team in each of the contests.

At Saskatoon, the teams are taken to the university demonstration plots. Probably in the forenoon they will be taken through the plots and the different experiments being conducted will be explained to them. They are then shown the various crops grown, and their usefulness, either for seed or forage, is explained. In the afternoon they are asked to identify a certain number of growing crops. They must also be able to recognize and name twenty or thirty weeds in full growth. Besides these identification tests, a grain-judging competition in wheat or oats is also arranged.

In this way, those competing acquire a great deal of useful information in a very enjoyable way. The contests, however, are not the only educational feature of the programme; for while the boys are at either Regina or Saskatoon, they are taken to all the places of interest in these cities. When in Regina, they are shown the Parliament Buildings, the P. Burns Packing Plant, etc., and while in Saskatoon, they are conducted through the University and also taken out to the big Dominion Grain Elevator, which is capable of storing over two million bushels of grain, and to the Dominion Forestry Farm at Sutherland, where the need for trees on the open prairie and the method of planting are explained.

Last year, the Regina and Saskatoon Exhibition Boards again generously agreed to refund railway fares above seven dollars to all boys attending the camp.

When in camp, the boys and their supervisors are the guests of the Exhibition Board. They are accommodated, as a rule, in one of the long corridors. The boys make their own cots, and the sleeping quarters are inspected daily to see that everything is clean and in place. Points are given each day to the team that keeps its quarters the tidiest, and a prize is generally awarded to the group of boys scoring the highest number of points at the end of the camp.

Discipline is maintained by decentralizing control. The camp is divided into four or more companies. and a supervisor is chosen to command each of these units. He is known as the Company's Captain. Each of the team leaders takes the place of a Lieutenant in charge of his own group. A camp manager and assistant, provided by the Extension Department, have full control.

Recreation is not forgotten, and every year the local Y.M.C.A. has undertaken to take charge of the sports, group games, drills, etc. It is their business to study boy life, and they know exactly what is required. The physical training in the morning, before breakfast, and the games and sports in the evening are always enjoyed. If it is wet, there are singsongs and indoor games in the gymnasium. As a rule, talks on health and hygiene are included in their programme. The camp would lose a great deal of its usefulness if it were not for the "Y".

Last year the Camp movement was extended to reach a still larger number of farm boys. The largest numbe that can be conveniently handled at either Regina or Saskatoon is about three hundred at each place, and this number was exceeded at Regina this last summer. This means that many boys in the province have been unable to attend camp. For this reason, smaller camps have been arranged at a number of the Class "B" fairs and last summer, three such camps were held, one at North Battleford, one at Melfort and one at Yorkton. These are conducted along the same lines as the larger camps.

only the boys are a little younger, thirteen to fifteen years of age. At the larger camps the boys stay for four days, but at the smaller camps only for two days. The competitions. lectures, games, etc., are, however, just the same. It is hoped this year to have four or five of the smaller camps as well as the two main camps

No one can realize the vast amount of good these Farm Boys' Camps are doing for the province. To many of the boys taking part in the competitions, it is the first trip away from the home farm. Many have never been in a city before and have never seen the sights which to us have lost their interest but to them are new and wonderful. No one knows what resolutions are being formed in the young minds; resolutions, perhaps, to take advantage of a university course; or to some day own the best herd of cattle in the province. The seed sown during the Farm Boys' Camps will bear abundant and useful fruit. The boys of to-day are the farmers of to-morrow, and the trend of agriculture will depend on the training they receive.

AGRICULTURE IN THE NOVA SCOTIA SCHOOLS

By L. A DeWOLFE B A M Sc, Director of Rural Science

IN the Province of Nova Scotia, a part of the Federal grant under the Agricultural Instruction Act has been placed at the disposal of the Department of Education. In administering this portion of the grant, we have interpreted the purpose of the Act to be educational rather than vocational. We believe that the public schools, taught by young girls, cannot turn out full-fledged farmers. We do believe, however, that the schools can give a fairly good idea of where the farmer stands in relation to the rest of the world. We can, for example, discuss the farmer's problems and activities in the geography class, and thus vitalize that subject.

Though the school will not make the boy a successful live stock man, it will call his attention to factors governing live stock which he might never have learned on the farm; then, whether the boy becomes a farmer or not, he will have a broader conception of the economic problems of the country on account of having his school lessons based on farm experiences. The Act will be of greater service if it teaches a large number of our children the science of farming and related industries than if it teaches only a limited number the art of growing field crops and farm animals.

Although our training is non-vocational, it may lead to a vocation. If a boy should become a farmer, his common-sense training will make him a better farmer and a much better citizen than he otherwise would have been Here and there, the bigger vision of a farmer's opportunities will induce a boy to remain on the farm. Statistics do not tell the whole story. The number of men on farms is not so important as the quality. We are trying to improve the quality of the next generation.

Farming, like any other industry, is economic. School children are not old enough to know the value of money; they will not, therefore, seriously consider farming as a future occupation; they think only of the present; they want "a good time." One purpose of the school, therefore, is to furnish the good time. It is a social problem—the problem of making young people in the country happy and contented.

We also attempt to develop common sense. By making agriculture the basis of home projects, we are popularizing the time-honoured school subjects. For example, instead of memorizing the climate of Argentina as an isolated topic, we raise the question of how a hail storm in that country in January might affect the price of flour in our own country. This leads to a discussion of the wheat-producing countries of the world and the seasons at which the crop is harvested and marketed A crop failure in one country affects prices in other countries. From this, the boy is led to study market reports and try to account for any great fluctuations. In other words, he is beginning to think about things; he is becoming intelligent.

Similarly, transportation problems are discussed. The markets of the world are studied; and the boy learns that to produce farm crops is one thing, but to market them is another. He will thus learn to be governed somewhat by the law of supply and demand. To know the science of soil cultivation is not enough, important as it is. When it is discovered, however, that competition drives us to do our best, we want to know the best way of doing things. Hence a desire to know is created. That is the greatest thing that can be accomplished in education.

To produce good crops requires a knowledge of soil physics, soil chemistry, insect life, bird life, plant physiology, and animal hygiene. To market the produce calls for a knowledge of geography, arithmetic, reading and writing, the world markets, transportation systems, labour problems, climate, and banking systems—all have a bearing on the farmer's prosperity. Studying geography from this, the agricultural point of view, the child sees that, after all, the subject has some relation to his own personal affairs.

Lest this become a theoretical essay, however, we hasten to say that in Nova Scotia, our share of the Federal grant is spent largely on training teachers at our Normal College and Summer School. They are trained along the lines indicated in the foregoing paragraphs. Not all teach as successfully as we wish, but they do much from the agricultural view-point. The grant has made such teacher-training possible. Without it, agricultural teaching in our schools, even in this indirect way, would suffer. School exhibitions, one of the big results of such training, would lose their driving power. We might slip back to the old custom of only the dull boy remaining on the farm while the bright ones went to the towns.

We are striving, and with some measure of success, towards a cultured rural population, enjoying good homes with attractive surroundings; taking an intelligent interest in civic affairs; having time for reading and recreation; in short, a people who use their heads as well as their hands.

DEVELOPMENT OF SCHOOL AGRICULTURE IN ALBERTA

By G B VAN TAUSK, M.A.

THE development of school agriculture in Alberta is to a great extent a repetition of what occurred in the older provinces and in the United States.

Agriculture was taught in both the elementary and high schools of the province in the territorial days and at the inception of the province (1905) The Course of Studies for examination for Standard V, approved in July, 1906, prescribes Agriculture. A general knowledge of the following topics was required: Soils, Crops, Live Stock and Dairying; Insects, Weeds, Trees. The pass mark was 34 per cent, and the reference book for teachers and pupils, "Agriculture" by James and McIntyre. In the high schools, standard VI, the same text was used and Bailey's "Principles of Agriculture" given as a teachers' reference. It is significant that the Course of Study gives no outline but simply states: "Agriculture—as in prescribed text." This high school Agriculture was taught in connection with botany.

Up to 1913 with a few isolated exceptions the teaching of school Agriculture and the management of school gardens was done very poorly. Some of the contributory causes were, the lack of appreciation of the subject, the lack of knowledge on the part of the teacher, and the lack or inefficiency of the assistance given by those in authority.

In 1913 a Director of Technical Education was appointed, who devoted part of his time to the organization and supervision of school Agriculture. It was generally felt that Agriculture should be introduced into the schools on a much broader scale than formerly, but that to add a considerable amount of work in the way of agricultural education, is asking the teacher to do more than can be properly done. Summer School courses in Agriculture were instituted for elementary and high school teachers and school inspectors. A year later Agriculture was put into the third year of the high school as a separate optional subject and an outline compiled showing the scope of the course. A new text book written from an Alberta point of view was introduced into the public schools in 1915. A 125 page bulletin on Agriculture and Gardening in Elementary Schools was issued by the Department of Education in 1916.

The effects of these innovations relative to School Agriculture may be gathered from the following quotations from the reports of the Department of Education:

"There has been also considerable improvement in the teaching of Agriculture in our public schools, due chiefly to the instruction given to the teachers at the Summer School, which had a larger attendance this year then ever before."

"School gardening is becoming an ordinary part of the work of most schools."

"There is no marked improvement in the teaching of Agriculture and nature study except in the case of the few teachers who have had an opportunity to secure some special training in these branches themselves."

"Nature Study and Agriculture were also neglected, as the teachers often do not know how to treat the subjects. The value of Summer Schools was very apparent here."

"With reference to the improvement of instruction in Agriculture and Gardening in both the elementary and secondary schools, I am

pleased to be able to report definite and substantial progress."

"The Inspectors' reports indicate also that the instruction is being given in a better and more practical way."

"The teaching of Agriculture is improving from year to year and the majority of teachers in Grade XI are supplementing the theoretical work with practical demonstrations by means of school gardens and experimental plots. The course of training given at the Summer School by specialists in Agriculture has created a keen interest in the subject and the competitions at School Fairs have stimulated the rural and town schools to attain a higher standard in this branch of school work."

The Summer School for teachers was the greatest factor in improving school Agriculture. As an institution it developed from slightly over one hundred students to six hundred and twenty. In 1922 12½ per cent of Alberta's teachers attended. The number of students taking Agriculture, however, has decreased. The main cause of the decrease was the gradual increase of the number of subjects taught. In 1922 eighty different courses were given, none of which was obligatory.

From 1916 until 1922, School Agriculture was well taught wherever a specially trained and enthusiastic teacher was employed, but in most cases it was made so formal that the real object and spirit of the subject was lost.

The school fair and home garden project movement, which has been fostered mainly by the Provincial Schools of Agriculture, has done as much or more than the classroom in furthering the agricultural education of Alberta's boys and girls. The work that is being done for Alberta boys and girls is accomplished by using the school organization for garden and live stock enterprises and having members of the Agricultural School staffs give direction in the schools with regard to these activities. During 1916 the number of schools organized for school fair work was only eighty-five, while in 1920 under the direction of the three Agricultural Schools there were held forty fairs, which included 440 schools, 6,500 pupils. In 1922 one hundred and thirty school fairs were held in Alberta with upwards of 1,500 schools participating.

A new course in high school Agriculture was introduced in 1915. This course, with little change is still in effect. It is generally taught by the science masters, many of whom have had Summer School or other training in Agriculture.

At that time 4·3 per cent of the teachers teaching High School Agriculture had good special training; 25·7 per cent had fair special training; 41·4 per cent had some training, and 28·6 per cent had no special training.

In September, 1922, a new course of study for the elementary schools came into effect. In this course for Grades VII and VIII five optional or directive courses have been drafted, two of which, the "General" and "Agricultural" contain Agriculture. As far as Agriculture is concerned the main differences between the two courses are: In the general course Agriculture is mainly appreciative and requires about 100 minutes per week; in the Agricultural course this subject is given 200 minutes and is both appreciative and practical. The aims and objectives of both courses are expressed as follows:—

"The work in Agriculture is intended to give pupils an understanding of the fundamental principles underlying the occupation which is the basis of our wealth and civilization, and to teach the natural laws underlying the pro-

duction of plant and animal crops. It is intended to present these principles in an intelligent and effective manner and to apply them in practical demonstrations such as: home projects, school gardens, identification and care of plants, milk testing, seed judging and other exercises which are adapted to use in elementary schools. Nor is the aim entirely materialistic. The spirit of the course is to enlarge the vision by actual contact with the facts and practices of farm life and place students in a position to appreciate the conditions of rural life, its problems, and the importance of the Canadian farmer."

THE USE OF BULLETINS AND PAMPHLETS IN THE SCHOOLS

By J. W. FIRTH, B.A., Normal School, Toronto

THERE is no doubt that in the distribution of publications of the Departments of Agriculture, many of them do not fulfil the purpose for which they were issued. Some of them are not removed from their envelopes, and more of them are thrown carelessly aside without being read. These are the seeds that fall on stony ground. But to the teachers of Agriculture in the rural schools these publications are an excellent aid in preparing their lessons and in teaching their pupils. The teachers in training in the Normal Schools are always anxious and pleased to receive any bulletins and pamphlets that are for distribution. The Ontario Department of Agriculture recognizes the value of placing these in the hands of the young teachers as many of these bulletins are sent to the Normal Schools for distribution. These are used by the teachers in training in Ontario for reference in the various subjects and for preparing lessons. In fact these bulletins have taken, in a large measure, the place of text books in the subject of Agriculture.

In using the bulletins for source books, the information is accurate and fairly complete. The books are small and easy to handle. There is usually one subject discussed in each pamphlet. They are well illustrated, and the pictures serve to interest the pupils and convey ideas that they do not otherwise obtain.

When a teacher has a number of these publications, some system should be devised for indexing and cataloguing them. In my work in the Normal School, Toronto, I use the scheme outlined in the Publications Index Book, Pamphlet No. 7, issued by the Publications Branch of the Dominion Department of Agriculture. These pamphlets are kept in my class room and are available for class use at any time. The Librarian of the Toronto Normal School, Miss Merchant, has an excellent system for filing pamphlets and bulletins. They are alphabetically arranged by subjects and kept in folders in a large filing cabinet. The student-teachers, in preparing their lessons, go to the cabinet, select the bulletins with little trouble, and return them to the cabinet when they have finished with them.

Many of the bulletins we distribute to the Normal School students are from the Ontario Department of Agriculture. These young teachers take them to their schools when they begin teaching. The information contained in them is taught to the children in the schools, and this knowledge filters into the homes through the schools. The teacher serves as a link in the chain of communication between the various Departments of Agriculture and the boys and girls who soon will be our young agriculturists.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

IRRIGATION INVESTIGATIONS IN ALBERTA

The accompanying article, prepared by W. H. Snelson, Senior Irrigation Specialist, presents in concise form a statement of the results of investigations conducted for a number of years past by the Irrigation Branch of the Dominion Reclamation Service, Department of the Interior, to determine the Duty of Water.

Conservation of Water Supply Necessary

IT is a disconcerting fact that, even if the maximum facilities for storage are provided and the most careful use is made of the available water, there will not be sufficient to irrigate more than 5,000,000 acres, or about 10 per cent of the land requiring irrigation in Alberta and Saskatchewan. To provide reservoirs for this limited supply and to so conserve and use it at all times that the greatest benefit may be derived by the greatest number, are tasks that today challenge the West.

In the early days of irrigation in Canada the streams carried a surplus of water, and irrigators, without thought of scarcity, applied it to their lands with lavish prodigality. Credit is due to the framers of the Irrigation Act, who, learning from the unfortunate experiences of the Western States and looking to the future when every drop of water would be needed, provided in the Act that a limit should be placed upon the quantity of water that might be appropriated for use per irrigable acre. Two acre-feet each irrigation season, or sufficient to cover each acre to a depth of two feet, measured at the point or points of delivery to any farm unit, was considered to be sufficient for the average need of crops in Western Canada and this quantity was established as the legal duty of water. In recent years it became apparent that even this was an excessive quantity to apply to most crops and the duty was therefore changed to one and one-half acre-feet per acre.

Minister of Interior Must Define Duty of Water

As the Minister of the Interior is responsible for the administration of the surface water supply of Alberta and Saskatchewan and particularly as he must define the duty of water—or water requirements of crops—according to locality and soil, duty of water investigations were commenced several years ago, from the results of which it is now possible to draw conclusions of great value and interest.

Need of Information in Irrigation Practice

A majority of the settlers on the irrigated lands of the West have an insufficient knowledge of the principles of irrigation practice and must be furnished with information and practical demonstrations in order that each irrigable acre may be so farmed and irrigated as to ensure

that the maximum possible production will be maintained from year to year and that, in so far as possible, water-logging of lands with the accompanying undesirable conditions of rise of ground water-table and surface concentration of injurious alkalies will be prevented.

There is a general tendency for irrigators to apply an incorrect amount of water to the crop being grown; to apply irrigations in such excessive depths per application as to contribute to the rise of the ground water-table through large percolation losses; to plan their distributary systems unwisely and thus make impossible the application of economical irrigations; and, due to a lack of understanding of the seasonal water requirements of crops, to irrigate at the wrong time.

Outline of Irrigation Investigational Work

In order to secure data which would serve as a basis for a definition of the legal duty of water, and from which principles for the guidance of water users could be formulated, the following work was carried out.

In 1913 irrigation investigations were begun in the Coaldale district of Southern Alberta where irrigation specialists, working in co-operation with the farmers, measured the water used in growing common crops under average field conditions.

In 1914 experiment stations were established at Strathmore and at Ronalane, Alberta. At these stations varying depths of water were applied to crops in order that reliable data might be obtained relative to:

1. The amount of water required to produce the maximum yield of specific crops when grown under varying conditions of soil fertility, soil texture and climate.

2. The proper depth of water to apply per irrigation for different soil types and for different crops.

3. The relationship between the irrigating head and the distance between distributing ditches.

4. The seasonal water requirements of various crops, or the times when irrigation water should be applied.

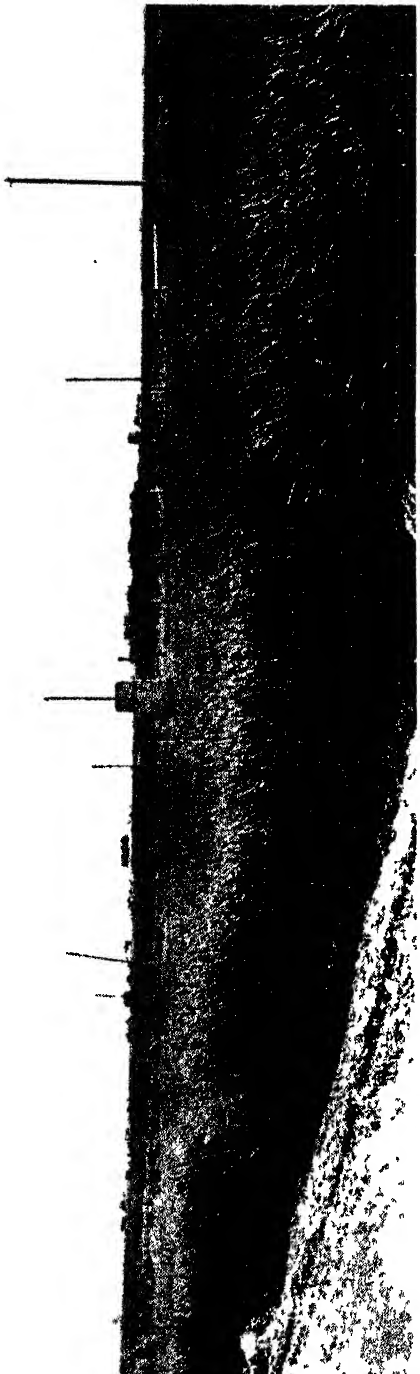
In 1917 the Dominion Irrigation Experiment Station was established at Brooks, Alberta. The most reliable and complete experimental data have been secured from this station because the soil conditions were more suitable and the experiments were much more carefully planned and carried out than was possible at either Strathmore or Ronalane.

Thus since 1913 the Reclamation Service has been gathering at Coaldale, Strathmore, Ronalane, and Brooks information regarding the duty of water for a variety of crops under climatic and soil conditions which are typical of different parts of Southern Alberta.

Duty of Water

Theoretically, the duty of water is the volume of water that is required to mature a crop on an acre of land. Under similar conditions it remains fairly constant for the same crop, but, as might be expected, it varies widely for different crops, soils, and climates. The most important factors which directly influence the duty of water, or water requirement, of any crop, are: the physical properties of the soil and subsoil, the fertility of the soil, the size of the irrigating head, the depth applied per irrigation, the preparation of the land, and the climatic conditions.

A grain crop to produce its maximum yield, will require more water; (*a*) when grown on open porous soils than when grown on heavy impervious soils; (*b*) when grown on infertile soil than when grown on fertile soil; (*c*) when applied in large irrigations than when applied in small;



Fifty bushels of Marquis wheat to the acre with five four inch irrigations. Brooks Irrigation Experiment Station.

and (*d*) where the land is rough and unprepared than where properly levelled, and more water where the climatic conditions are of an arid nature than where humid.

The accompanying table gives the mean depth of water required to produce the maximum yields of various crops at the Brooks Experiment Station, during the four years 1918-21 inclusive. The results from all the experiments made with each crop are averaged.

For alfalfa, seed alfalfa, grasses, and peas, the figures given represent the requirements of these crops when grown under optimum conditions of soil fertility; for the other crops listed the figures represent the water requirements of these crops when grown under average conditions of soil fertility.

Crop	Total Depth of Water Irrigation Plus Precipitation Required to Produce the Maximum Yield per Acre
Alfalfa	31 inches
Peas	27 inches
Wheat	23 inches
Barley	20 inches
Oats	19 inches
Grasses	18 inches
Alfalfa Seed	18 inches
Potatoes	20 inches
Corn	16 inches
Flax	16 inches

The average precipitation during the growing season for the four-year period, 1918 to 1921, was five inches.

The following table shows the effect of soil fertility upon the water requirement of wheat.

Yield in Bushels per Acre	Water Requirements in inches of depth: When Grown on Fertile Soil	When Grown on Poor Soil
10	10	13
20	11	18
30	12	24
40	14	..
50	22	..

A yield of thirty bushels per acre required twice as much water where grown on poor soil as when grown on fertile soil. Further, the poor soil

could not produce more than thirty bushels per acre with any amount of water.

Summary of results obtained at Ronalane Station.

Crop	Total Depth Water in Inches Required to Produce Maximum Yield per Acre
Peas	27 inches
Wheat	26 inches
Oats	22 inches
Barley	21 inches

When comparing Ronalane results with the results obtained at Brooks, two factors influencing Ronalane yield have to be taken into consideration:

(*a*) All crops grown at Ronalane may be considered as being produced under "optimum" conditions of soil fertility as the Ronalane plots were manured heavily each year, while those at Brooks were not.

(*b*) The soil at Ronalane is but two to three feet in depth, underlain with gravel, and has a much lower water-holding capacity than that at Brooks. This difference alone will account for so much more water being required to produce the maximum yield per acre at Ronalane than at Brooks.

As a result of the experimental work carried on at the several stations the Reclamation Service has reliable data relative to:

(*a*) How much water crops require.

(*b*) When and in what depths per irrigation this amount of water is most economically applied.

(*c*) How and where the distributary ditches should be constructed and located, and

(*d*) What crop rotations are best adapted to the various districts.

Flax Plots. Brooks Plots, 1922. Maximum Yield, 30 bushels per acre.

A complete review of these investigations has been published by the Department of the Interior in Bulletin No. 6, entitled "Irrigation Practice and Water Requirements for Crops in Alberta". This bulletin is now available to those interested in irrigation practice upon application to the Director of the Reclamation Service at Ottawa, or the Commissioner of Irrigation at Calgary.

In addition to distributing the data available by means of Bulletin No.

6, farmers' institutes are held in the various irrigation districts at which a representative of the Reclamation Service addresses the water users upon the different phases of irrigation practice and by means of charts and diagrams demonstrates the water requirements of crops, the methods of preparing land and of applying water, and other related matters.

Field Demonstrations

In order that the information gained at the experiment stations might be applied to field practice, and that the water users might be furnished with a practical object lesson in irrigation on their own farms, a programme of field demonstration work was arranged and put into operation in the spring of 1922. This programme provided for the establishment of one or more demonstration tracts in each irrigation district, where irrigation specialists working in co-operation with the farmers upon whose lands the demonstration tracts were located would apply the correct amount of water for the crops being grown, in such depths per irrigation and at such times as local conditions warranted. In carrying out the demonstration work on the tracts selected the irrigation specialist would furnish the farmers with an example of how their fields should be prepared, ditched, and irrigated so as to produce the greatest possible yields per acre in the most economical manner.

The demonstration work has been productive of very satisfactory results. The following will serve as an illustration of the methods used and benefits derived.

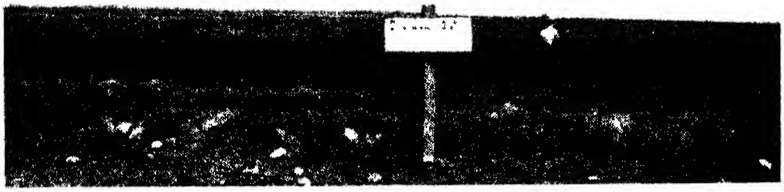
Banner Oats following Clover Brooks Plots, 1922. Maximum Yield, 127 bushels per acre.

In the spring of 1922 a tract of 4 57 acres was selected upon the farm of Mr. F. A. Cook in section 21, township 9, range 16, west of the 4th meridian. The land was ploughed, harrowed, and levelled on May 15 and on May 25 was seeded with Marquis wheat, one and one-half bushels per acre being sown.

The demonstration tract was divided in two parts, one of which received eighteen inches of water in three irrigations of six inches depth each, the other received eighteen inches of water in four irrigations of

four and one-half inches depth each. These irrigations were applied under the supervision of the irrigation specialist. The farmer applied one irrigation only to the main part of the farm.

	Main Field	4½-inch irrigation tract
Cost of irrigating per acre. ..	$ 1 25	$ 3 15
Gross returns from crop grown on an acre at 75c. per bushel.	17 45	35 55
Gross returns less cost of irrigating..	$16 20	$32 40



Marquis Wheat; Taber Demonstration Plots.

The tract watered with four and one-half inch irrigations produced 47·4 bushels per acre, that watered with six-inch irrigations produced 39 bushels per acre, while the remainder of the farm which received only one irrigation produced but 23 bushels per acre.

The above figures show a gain in gross return of 100 per cent in favour of the field which received the four light irrigations. The farmers in the new irrigation districts express themselves as being well pleased with this work and favour its extension to all parts of the irrigation districts as rapidly as possible.

DOMINION AGRICULTURAL LEGISLATION

On motion of the Minister of Agriculture, the Honourable W. R. Motherwell, the following resolutions were passed by the House of Commons:

Resolved, that it is expedient to amend the Cold Storage Act, chapter six of the statutes of 1907, and to provide that the Governor in Council may enter into contracts with properly constituted co-operative societies or associations, for the construction, equipment and maintenance in efficient working order of public cold storage warehouses in Canada equipped with mechanical refrigeration, and suitable for the preservation of any food product.

Resolved, that it is expedient to bring in a measure to amend and consolidate the Acts respecting Live Stock, and to provide for the establishment and regulation of live stock exchanges in connection with stockyards, the making and amending of by-laws, the issuing of licenses for commission merchants, the creation of Exporters' Associations, the regulation and issuing of licenses therefor, the equipment and regulation of

stockyards, the fixing of tariffs of fees therefor, the prescribing of general regulations of stockyards by the Governor in Council, the requirements for shipping of live stock, the creation of inspectors and the providing for ports of importation; and to provide penalties for violations of the Act.

Resolved, that it is expedient to bring in a measure to regulate the Sale and Inspection of Fruit and Fruit Containers, and to provide for the fixing of grades for fruit in closed packages, and apples, crabapples and pears in boxes; for the marking and repacking of fruits grown in Canada; for the packing and branding of such fruit; for the regulation of dimensions of all packages, barrels and other containers of fruit; for the defining of the powers of inspectors; for the different penalties in consequence of the violations of the Act; and for the procedure to be followed in the enforcement of the Act and of the penalties prescribed.

Resolved, that it is expedient to bring in a measure to regulate the Testing, Inspection and Sale of Seeds, and to provide for the regulation of the sale of clover, grasses, seed grain and fodder seeds, rape, field root and garden vegetable seeds in lots of over one pound, of one pound or less, and of seeds for export when purporting to have been inspected and graded; for the regulation of the importation of seeds; for the fixing of the powers and duties of inspectors, the time limit for complaints, the method of taking official samples, of making official reports and the publication of the same; for the fixing of penalties in connection with the violation of the Act, the liability of certain purchasers, the costs of proceedings, the rights of civil process and the evidence acceptable in all cases.

Following the passing of the Resolutions the undermentioned Bills were introduced and passed their first reading:

Bill No. 9, to amend the Cold Storage Act, 1907.

Bill No. 10, to amend and consolidate the Acts respecting Live Stock.

Bill No. 11, to regulate the sale and inspection of fruit and fruit containers.

Bill No. 12, respecting the testing, inspection and sale of seeds.

THE ADMISSION OF CANADIAN STORE CATTLE TO GREAT BRITAIN

The Importation of Animals Act passed by the Parliament of Great Britain at the Second Session of 1922, states the conditions under which Canadian cattle may be imported to that country. A summary follows of the leading provisions of the Act, which constitutes an amendment of the Diseases of Animals Acts, 1894 to 1914, and this Act may be cited together as the Diseases of Animals Acts, 1894 to 1922.

Importation of Canadian Store Cattle

Canadian store cattle may be landed in Great Britain without being slaughtered, provided:

(*a*) That they are marked indelibly in such manner as the Minister of Agriculture for Great Britain may prescribe, and have been shipped direct from a Canadian port in an inspected vessel suitable and properly equipped for the purpose.

(*b*) That the cattle were for a period of three clear days immediately before shipment, and during shipment, kept separate from other animals, and that on examination during the three day period and daily during the voyage by a veterinary officer of the Dominion

none was found to be affected with cattle plague, pleuro-pneumonia, foot and mouth disease, or mange.

(*c*) That the vessel during the voyage enter no port outside Great Britain, and that the cattle be landed at an approved port.

Upon landing, the cattle will be detained in isolation until they have been examined and their movement has been licensed. In the event of the presence of cattle plague, pleuro-pneumonia or foot and mouth disease being discovered, all the cattle then in the landing place shall be slaughtered.

Should the Minister have reason to believe that either of the diseases mentioned in the foregoing paragraph exists in Canada, these provisions may be suspended for such time as may be deemed necessary to avoid the risk of the introduction of the disease into Great Britain.

Importation of other Animals

The Minister of Agriculture of Great Britain is given power to authorize conditionally the importation of any Canadian animals, other than store cattle. In the case of cattle the provisions are the production of a certificate from a duly authorized Dominion officer to the effect that the animals were within one month before shipment effectively tested for tuberculosis and found to be free therefrom; said animals to be landed in accordance with such conditions as the authorities may prescribe and deem necessary to prevent the introduction of disease, other than tuberculosis.

The expression "Canadian" in relation to any animal means born and reared in the Dominion of Canada The expression "store cattle" refers to bovine animals, castrated or spayed, which are intended for feeding purposes and not for immediate slaughter.

Compensation is not payable in respect of slaughter of imported animals.

A fee not to exceed sixpence per head will be charged on imported animals to cover veterinary inspection expenses.

Regulation of Movement of Imported Cattle

The schedule appended to the Act provides that the license granted for the removal of imported cattle from the landing place shall authorize removal either to a market, slaughter house or other premises. When cattle are removed to an authorized market they shall be kept separate from all animals other than imported cattle. For their removal from said market, a license is required, and shall accompany the cattle during the time they are being moved. They shall so far as practicable be moved direct and by rail without unnecessary delay to their authorized destination. In transit they are not to be removed from the trucks except for being fed or watered.

Nothing in the said schedule is to apply to imported cattle intended for exhibition or other exceptional purposes.

The Act comes into operation by Order-in-Council on April 1, 1923, or on such previous date as the Order may appoint.

CATTLE EXPORTERS' CONFERENCE

Towards the end of January, 1923, a conference was held between the officers of the Live Stock Branch of the Federal Department of Agriculture and representatives of the stockyards, abattoir companies, packing companies, live stock associations, and others, in connection with the export of Canadian cattle to Great Britain following the removal of the cattle embargo. The subjects under discussion had reference to the development of a permanent export trade, including the establishing of facilities at ocean ports and of union stockyards at Montreal and other central points; the question of land and ocean freight rates, and other matters that have been engaging the attention of the officers of the Department since the removal of the restrictions referred to.

Those present were:—

J. J. Morrison, Toronto.
F. S. Fulthorpe, Toronto.
Geo. Rountree, Toronto.
Mr. Ferguson, Toronto.
A. Talbot, Toronto.
E. Maybee, Toronto.
F. Collyer, Winnipeg.
H. Talbot, Winnipeg.
A. Muir, Winnipeg.
Duncan Campbell, Montreal.
Donald Munro, Montreal.
E. J. Coughlin, Montreal.
Dr. J. H Grisdale, Ottawa.
H. S. Arkell, Ottawa.
D. M. Johnson, Ottawa.
P. E. Light, Ottawa.
L. L. Cooke, Ottawa.
R. S. Hamer, Ottawa.

The following resolutions were adopted.

Moved by E. Maybee and seconded by H. Talbot that the handling of space for export cattle shipments and arrangements for transportation be placed with Messrs. Alex. Muir, Duncan Campbell, Donald Munro, E. J. Coughlin, and further that the parties named co-operate with representatives from Live Stock Export Shippers' Committee in making negotiations with steamship companies. Further that representatives of this committee be as follows: One from Western Canada, one from Eastern Canada, one from the Federal Department of Agriculture. The naming of the committee to be left to the Chairman of the Conference.

Moved by Geo. Rountree and seconded by Mr. Ferguson that all transportation matters be referred to the committee mentioned in the foregoing resolution.

Moved by Mr. Munro and seconded by Mr. Collyer,—

"Whereas the existing scattered system of stockyards established by the different railways at their terminal points at the extreme ends of the city of Montreal where markets are held simultaneously, is inadequate and detrimental to the interests of live stock producers using these yards, as well as to the consuming public, thus imposing a heavy and unnecessary burden of expense on both, without giving adequate compensating returns; and

"Whereas the port of Montreal is the principal export outlet in the Dominion for agricultural products, and as live stock already forms a large part of the country's exports and in the future will form a larger part, modern centralized accommodation for the efficient and economical handling and marketing of live stock passing through these yards for home consumption, or for export, is an urgent necessity;

"Be it resolved that in order to remedy the existing defects this meeting of exporters and the representatives of the live stock producers do hereby endorse the action of the Minister of Agriculture in appointing a

committee to report on the advisability of establishing union stockyards at or near Montreal, and desires to place itself on record as being impressed with the urgent necessity of the immediate construction of such yards, and recommends that the costs of construction should be borne by the transportation companies interested, with the control and operation vested, as in St. Boniface, in representatives of those corporations and a nominee of the Provincial Government."

Moved by Mr. H. Talbot and seconded by Mr. Morrison, that the Department be requested to make an effort to work out a system to be presented to Parliament for adoption at the next session which will influence and assist farmers in exporting a class of cattle such as may safeguard the permanent development of our cattle trade.

REPORT OF THE SPECIAL COMMITTEE ON FAIRS AND EXHIBITIONS

The Dominion Minister of Agriculture, Honourable W. R. Motherwell, recently appointed a committee for the purpose of enquiring into the matter of Federal assistance to agricultural exhibitions, and as to the manner in which their usefulness might be increased and made a factor in the development of the live stock industry of Canada. The committee consisted of the Deputy Minister of Agriculture, Dr. J. H. Grisdale, the Live Stock Commissioner, Mr. H. S. Arkell, and Messrs. D. T. Elderkin, Regina; F. L. Fuller, Truro; S. E. Francis, Sherbrooke; and G. Morrisset, Quebec.

The conference was presided over by Dr. Grisdale. At its conclusion the committee presented to the Minister the following report:

"Your committee appointed to investigate the possibilities of increasing the usefulness of the agricultural exhibitions in Canada begs to report as follows:

The Committee held its first meeting at Brandon, Man., on Tuesday, December 12, 1922, with Dr. J. H. Grisdale as chairman and Mr. H. S. Arkell as secretary, Messrs. D. T. Elderkin, Regina, Sask., and S. E. Francis, Sherbrooke, Que., sitting on the committee. Mr. F. L. Fuller, Truro, N.S., was unable to be present. This meeting was very representative of Western Canada as there were present the Deputy Minister of Agriculture for each of the Prairie Provinces, the Live Stock Commissioners for all four provinces, and delegates from the Exhibition Associations at Brandon, Regina, Calgary, Edmonton, Vancouver, and New Westminster.

A further meeting was held at Ottawa, on Thursday, January 4, 1923, with Dr. J. H. Grisdale as chairman, and Mr. H. S. Arkell as secretary. All members of the committee were present, viz: D. T. Elderkin, S. E. Francis, F. L. Fuller, and G. Morisset representing the French-speaking Canadian Fairs. Representatives of the leading fairs and exhibitions in Eastern Canada were present, together with the Deputy Ministers of Agriculture of the Provinces of Ontario and New Brunswick.

In addition to the suggestions made at these two meetings there were placed at our disposal by the various Fair Associations the latest copies of their prize lists, catalogues, auditors' reports, and statements giving the amounts of prize money offered and paid, and numbers of entries for each breed of live stock.

As a result of the information gathered, your committee submits the following conclusions:

(1) Exhibitions having been in continuous operation in Canada for upwards of half a century and having increased in popularity from year to year, may be considered to have become permanent institutions of the people. Believing the agricultural exhibitions are most valuable mediums through which information may be disseminated, no effort should be spared to bring home to exhibition visitors the lessons they should learn in order to make agriculture more profitable to those engaged in this basic industry.

(2) As there are in each province one or more exhibitions which are interprovincial in their scope and, as such merit financial assistance from the Federal Government, this assistance might be offered under more stringent conditions than have obtained in the past. The larger part of the grant should be devoted to the encouragement of the live stock industry, and we recommend that it should be used to supplement the prizes offered for such breeds as are particularly suited to the province in which the exhibition is held. Believing that at this period it would be an economic waste to encourage the multiplication of live stock that has not proved its worth, there should be selected at each exhibition three breeds each of heavy horses, other than draft horses, and swine; six breeds of cattle, five of sheep and ten varieties of poultry. The breeds and varieties to be selected as hereinafter provided, on the understanding that those named shall be the ones most worthy of encouragement because of their value to the live stock industry. More breeds than the numbers referred to may be included in any prize list, but the amount offered for competition among these breeds or varieties shall in no case equal the amount offered for the favoured breeds.

(3) It is recommended that a portion of the Federal grant, supplemented by funds from any other source, should be devoted to prizes for commercial classes of live stock, educational live stock exhibits and demonstrations in the interests of the live stock industry, and to boys' and girls' work, including live stock classes, judging competitions and other educational features.

(4) That visitors should be encouraged to take more interest in the exhibits and live stock judging, and to this end Associations should be urged to supply suitable accommodation for the public at the judging rings, to make the live stock stables and surroundings more attractive, to display prize cards giving information as to class, section and owner above each prize winner, and to issue and distribute a catalogue of the live stock department.

(5) The question of augmenting prizes in the case of large classes was considered, and it was apparent that no system should be adopted which would unduly increase the prize moneys that the fair would be obliged to pay. The justice is noted, however, of recognizing by increased money large numbers of exhibits. How this may best be done is not now apparent, but should be referred to the individual association for further consideration and experiment with a view to determining a permanent policy.

(6) There is need for greater care in the selection of live stock judges and for more uniformity in their work. These difficulties may be lessened with the co-operation of the Breed Associations. We would recommend that each of the large Breed Associations be asked to appoint a small special committee to compile a select list of qualified judges for their respective breeds, and

that those so selected should be invited to attend the next Royal Winter Fair, where they will be required to spend a stated time together studying the live stock exhibited, comparing ideas as to type, conformation, etc., and arriving at as nearly as possible a fixed standard of judging. Were this done every year with different men, it would not be long before the breed associations would have a list of judges that they could confidently recommend to exhibition associations. We further consider it desirable that the breed committees prepare for each province a list of prospective judges at exhibitions in their own province, thus training them to qualify as judges for the smaller exhibitions and gradually working up to the principal judges at the large exhibitions. It is, in our opinion, very desirable that the Federal Government should continue its present policy of assisting the associations to secure judges for live stock and poultry, but that this assistance be confined to judges recommended in cases where a breed association has carried out the aforementioned plan. Should any exhibition association deem it advisable to take upon itself the responsibility of securing judges they should be permitted to do so on the understanding that Federal aid for such judges will be withheld.

(7) That the working out of the general details of the policy as above suggested, viz: selection of favoured breeds, decision as to what commercial classes are to be included at individual exhibits, arrangements for demonstrational features, boys' and girls' work, etc., should be referred to a provincial or interprovincial committee, consisting of representatives of the provincial governments, agricultural colleges, exhibition associations and other organizations interested, to be convened at a suitable date by a representative of the Federal Department of Agriculture.

(8) It is considered that the practical working out of these plans can be best secured by holding another meeting of the representatives of exhibition associations next fall after these plans have been tried out for a season, and that the Minister of Agriculture should be requested to arrange for such a meeting in due course.

(9) It has been suggested that a Federal Association of Fairs and Exhibitions should be organized, and we recommend that consideration of this matter should be postponed until the above-mentioned convention.

In conclusion we wish to refer to the splendid unanimity of opinion expressed by all those present at the meetings, that this is an opportune time to bring our exhibitions into a closer relationship with the efforts of the Federal Department of Agriculture, and also to the desire of all the representatives to feature the educational in their exhibitions to the limit of their power.

Your committee also desires to express their appreciation of the action of the Federal Department of Agriculture which has made possible this investigation, and has, we believe, inaugurated a new era in the history of Agricultural Associations.

The encouragement thus offered will, we are confident, have far-reaching effects, and we present the preceding report as a comprehensive summary of the opinions held by the most representative of those interested in the development of agricultural activities in the Dominion of Canada.

Respectfully submitted,

J. H. GRISDALE,
Deputy Minister of Agriculture,

H. S. ARKELL,
Live Stock Commissioner,

D. T. ELDERKIN,
F. L. FULLER,
S. E. FRANCIS,
G. MORRISSET.

ADVISORY SEED BOARD MEETING

THE provisional Advisory Seed Board met in Ottawa on the 23rd of January to consider and recommend a revised draft of the Seed Control Act to present to Parliament at the session of 1923. There were present six representatives of the seed trade, namely, Messrs.—

E. F. Crossland of the Steele Briggs Seed Co., Toronto, Ont.

Col. W. H. Bruce of John A. Bruce and Co., Hamilton, Ont.

Kirby White of the D. M. Ferry Co., Windsor, Ont.

Wm. Ewing, Wm. Ewing Co., Montreal, Que.

A. E. McKenzie, of the A. E. McKenzie Co., Brandon, Man.

Hector L. Dery, of Dery Seed Co., Montreal, Que.

and six representatives of agricultural and horticultural growers, namely, Messrs.—

H. G. L. Strange, Fenn, Alta.

Stewart Corner, Kenora District Cooperative Clover Seed Growers' Assn., Oxdrift, Ont.

Frank Lewis, Burford, Ont.

Walter J. Cook, Ontario Vegetable Growers' Association. Camille Legare, vegetable growers, Montreal, Que.

W. H. McGregor, Miscouche, P.E.I., could not reach Ottawa and Mr. T G. Raynor of the Seed Branch Staff acted in his stead.

Others were present and took part in the discussion but did not vote.

In drawing up the new Seeds Bill, a first draft was made at the Seed Branch headquarters embodying the principles of advanced seed legislation in other countries to protect Canadian agriculture, as well as including the provisions and making changes found advisable in the administration of our Seed Control Act over a period of sixteen years. This first draft of the proposed Seeds Bill was submitted to conferences of the Seed Branch staff and District Inspectors and the Canadian Seed Trade before revising to present to Agricultural Associations at the meeting of the Advisory Seed Board.

Provisions recommended by the Board require the grading of clovers, grasses, including lawn grass, seed grain and fodder seeds and the testing and grading of these seeds at a Seed Laboratory or by a Seed Inspector, and either the grading of field root and vegetable seeds or the labelling with the percentage of germination when such percentage is below the minimum percentage of germination fixed by regulation.

Two very important new clauses were introduced by the seed trade and approved. They will require that any new kind or variety name that is not generally employed in Canada for that particular kind or variety during the year ending March 31, 1923, may not be used until it has been licensed by the Minister, who will appoint some person or persons to make propagating tests and issue certificates of their determination to the inspectors The other clause forbids any person falsely to represent the quality, character, nature, variety or description of seeds or plants of any kind or variety. There were other minor changes made in the draft of the Bill.

REPORT OF THE ONTARIO AGRICULTURAL DEVELOPMENT BOARD

During the year ending October 31, 1922, the first year of operation, more than 4,000 enquiries and 1,191 formal applications for loans were received by the Agricultural Development Board of the Province of Ontario. Of this number 458 were granted and 178 are still under consideration. It is evident from the large number not granted that many applicants could not qualify for loans under the terms of the legislation. It must be remembered, that for the first half of the present fiscal year, the Board did not have authority to grant loans for the removal of encumbrances, as is now the case under legislation of last session. On this account, many applications could not be granted. In a few cases, applications were made for loans for the purposes set forth in the Act, but before the money was paid over, it was found that it was really to be used for other purposes outside the Act. Such loans were immediately cancelled. It is of interest to note the manner in which the loans issued were distributed among the purposes set forth in the Act, which was as follows:

	Per cent.
Purchase of land..	47
Erection of Buildings.. ..	14
Settling Estates..	8
Discharge of Mortgages..	25
Drainage..	6

From these figures it is evident, states the report, that this new system of rural credits is filling a real need in the agricultural life of the province

CONFERENCE ON THE CONSERVATION OF WILD LIFE

A Round Table Conference of Federal and Provincial game officials was held at Ottawa in December last. This was under the auspices of the Canadian National Parks, and is the first convention of its kind ever held in Canada.

Those present were: J. B. Harkin, Commissioner, Canadian National Parks, O.S. Finnie, Director of Northwest Territories and the Yukon, G. P. MacKenzie, Gold Commissioner for the Yukon Territory, J. A. Knight, Commissioner of Forests and Game for Nova Scotia, L. A. Gagnon, Chief Game Guardian for New Brunswick, Benjamin Lawton, Chief Game Guardian for Alberta, F. Bradshaw, Chief Game Guardian for Saskatchewan, J. H. Evans, Deputy Minister of Agriculture for Manitoba. D. McDonald, Deputy Minister of Game and Fisheries for Ontario, J. A. Bellisle, Chief Game Guardian for Quebec, C. C. Parker, representing the Department of Indian Affairs, Hoyes Lloyd, Supervisor Wild Life Protection, Harrison F. Lewis, Chief Federal Migratory Bird Officer for Quebec and Ontario, R. W. Tufts, Chief Federal Migratory Bird Officer for the Maritime Provinces, Norman Criddle, Dominion Department of Agriculture, J. W. Coffey, District Inspector of Game and Fisheries for Ontario, I. Heckt, Game Inspector for the Province of Quebec, Dr. Seymour Hadwen, of the Northwest Territories Branch, Arthur Gibson, Dominion Entomologist, Lieutenant-Colonel C. Starnes, Assistant Commissioner of the Royal Canadian Mounted Police, Dr. R. M. Anderson, Chief of the Biological Division,

Department of Mines, Professor E. E. Prince, Dominion Commissioner of Fisheries, P. A. Taverner, Ornithologist, Department of Mines, Mrs. Elizabeth Hewitt, Convener, Conservation Committee, National Council of Women, and others.

The conference was opened by an address of welcome, which was delivered by Hon. J. H. King, Minister of Public Works. Mr. King referred to the potential value of Canada's wild life and the obvious reasons for conserving it.

The proceedings of the conference were marked by a splendid spirit of co-operation, and all the resolutions adopted were adopted unanimously. These resolutions dealt with many important matters, such as, a Dominion wide educational campaign in the interest of wild life conservation, general prohibition of the sale of game, uniform adjustment of the "bag limit" for Canada and the United States, federal assistance for the Provinces in controlling illegal shipments of game and fur, a gun license system for all hunting, alteration of present open and closed seasons for several species of birds, and protection of marine mammals.

The problem of controlling the wolf and coyote menace in the West, was thoroughly discussed and the opinions of those taking part in the discussion were frequently at variance, but many helpful suggestions and interesting points were divulged.

It was obvious at the conference that both the Provinces and the Dominion realize their distinct responsibilities in the matter of the guardianship and development of Canada's wild life resources, and that with intelligent conservation and utilization there is no reason why this natural asset should not be preserved and constitute a perpetual source of profit. It was felt that conditions in other countries are such that, at least insofar as big game is concerned, Canada is destined to soon enjoy a practical monopoly on this continent.

Mr. Arthur Gibson, Dominion Entomologist, presided over the sessions

THE FINCH DAIRY STATION REPORT

In 1922 the patrons at the Finch Dairy Station were paid over $20,000 in excess of what they would have received if they had been paid at the average rate received by patrons of cheese factories. This advantage comes partly from the fact that the Station is equipped to make butter or cheese and to sell milk or cream according to the best market offering. Every factory is not so well located as Finch, and it is not pretended that the experience at the Finch Station should be duplicated in every case; but there are many places where larger factories could be built up and a better market secured by equipping them along the same lines. The Station is operated as a demonstration by the Dairy Branch of the Federal Department of Agriculture. It shows a handsome profit on the year's business, and is an outstanding example of a well managed Government institution.

The following statement shows the quantity of milk received month by month and the disposal of same at the Finch Dairy Station for the calendar year 1922:

BUSINESS OF THE FINCH DAIRY STATION, 1922

Month	Milk Received	Cheese Manfd.	Milk Sold	Fat in Cream Sold	Butter Manfd.	Net Price per 100 lbs. Milk to Patrons
	lb.	lb.	lb.	lb.	lb.	$
Jan...	219,838			8,744		1·75
Feb .	245,980			9,019		1·61
Mar . .	645,955			17,925	4,787	1·36
Apr ...	632,973			17,195	4,185	1·33
May.	904,431		4,125	22,870	8,792	1·19
June..	1,116,794	4,460		24,759	14,818	1·30
July. ..	1,162,109	1,580		33,293	4,373	1·31
Aug . .	1,161,783	705		33,082	6,286	1·30
Sept	1,042,075	10 280		27,930	3,244	1·31
Oct	778,070	22 388		18,140	2 966	1 68
Nov	469,369	5,911	14,000	16,177	938	2 24
Dec	402 502		8 000	16 655		2 09
	8,781,879	45,324	26,125	245,789	50 389	1 43

The net value of the milk per 100 pounds varies from month to month according to the proportion of the milk disposed of in different ways. The total receipts of milk (8,781,879 pounds) are over four times as much as were received during the year 1912 (2,069,281 pounds), which was the first year of operation.

An addition to the building was completed during the year to enable the factory to handle the constantly increasing supplies of milk. The management find themselves now in this difficulty, that patrons from surrounding factories are clamouring to be admitted to Finch, and the usual complaint of a Government institution operating against private enterprise is raised by the owners of other factories, although the patrons at Finch derive no benefit from the fact that it is a government institution.

DOMINION EDUCATIONAL CHEESE SCORING CONTEST

A New Service

In addition to the Dominion Educational Butter Scoring Contest, which will be conducted this year on the same conditions as last year, the Dominion Dairy and Cold Storage Commissioner has this year established a Dominion Educational Cheese Scoring Contest.

1. The contest will cover six months from May to October inclusive.

2. The samples (a full or half-sized Cheddar cheese) must be made between the 1st and 10th of each month and shipped by express (charges collect) to the Dairy and Cold Storage Commissioner, c/o Harbour Cold Storage, Montreal, P.Q., to arrive on or before the 20th of each month.

3. The provincial dairy authorities will be asked to select the cheese factories for the contest each month, according to the following allotment:

Prince Edward Island, 1 factory each month.

Nova Scotia, 1 factory each month.

New Brunswick, 1 factory each month.

Quebec, 4 factories each month.

Ontario, 4 factories each month.

Manitoba, 1 factory each month.

Saskatchewan, 1 factory each month.

Alberta, 1 factory each month.

British Columbia, 1 factory each month.

Different factories to be selected each month.

4. Blank manufacturing record forms and full shipping instructions will be mailed from Ottawa to each factory participating in the contest.

5. The cheese will be scored a few days after arrival in Montreal. Copies of the manufacturing records and scores will be mailed to every cheese factory in Canada.

6. The Department will pay for the cheese at current market price at the time of shipment.

THE DIRECTOR OF EXPERIMENTAL FARMS AND THE DOMINION ANIMAL HUSBANDMAN TO VISIT GREAT BRITAIN

The principal object of the proposed visit of the Director of Experimental Farms, Mr. E. S. Archibald and the Dominion Animal Husbandman, Mr. G. B. Rothwell, to Great Britain is to attend the London Shire Show, the greatest heavy horse show of its kind in England. They will also visit one or two other prominent winter shows and will make a selection of the Shire horses being donated by the Shire Horse Association to the Dominion Government.

These officers will also carefully examine some outstanding herds of Yorkshire and Tamworth swine in the Old Country, with a view to making an importation of these for placing on the Dominion Experimental Farms System In view of the present status of the bacon industry in Canada and the fact that many of the Yorkshire herds on the Experimental Farms are seriously handicapped in further constructive breeding work owing to lack of a sufficient number of high class boars of outstanding breeding and type, it is thought that this importation of a number of choice boars and a few sows will materially strengthen the breeding work on the Experimental Farms and render excellent service to the breeders of bacon hogs through the distribution of young breeding stock thus made possible.

It is also intended to make a small importation of breeding rams of several of the breeds already established on the Experimental Farms.

THE CREATION OF THE DIVISION OF BACTERIOLOGY AT THE EXPERIMENTAL FARM

The Division of Bacteriology of the Experimental Farms Branch, just recently formed, has for its object the carrying out of bacteriological investigations connected with the research work of several other divisions on the Central Farm, in addition to such independent investigations as may be found desirable from time to time. One great need for this division is in connection with work in dairy bacteriology and with the health of animals from the point of view of stable sanitation. There is also a wide field for work in connection with the bacteriology of soils and fertilizers as well as many problems in connection with poultry work. In fact, there are few, if any, divisions of the work in the Experimental Farms Branch where problems in bacteriology do not press for solution. The Division of Bacteriology, then, while not infringing upon, or duplicating, the work now carried on in the Plant Pathological Laboratories, will work in the closest co-operation with all other features of the Experimental Farm activities.

THE GIFT OF CERTAIN BREEDING ANIMALS TO CANADA BY THE BRITISH SHIRE HORSE ASSOCIATION

The British Shire Horse Association has felt that their field for the sale of breeding stock was not as wide as it might very properly be, and that there were parts of Canada where the breeding of heavier draft horses would be advisable, and that, to attain this end, the use of Shire blood would seem to be warranted. The Duke of Devonshire on several occasions has spoken very forcefully on this matter, and as a result the British Shire Horse Association made an offer to the Canadian government to present to Canada two choice Shire stallions and three in-foal mares, these animals to be located on one of the Dominion Experimental Farms.

This is an excellent manner of bringing to public attention the merits of the Shire horse, and is sure to be appreciated by the people in Canada interested in horse breeding even though many of them may be strong supporters of other breeds. There is no doubt that the present critical condition of the horse-breeding industry in this country is due, not so much to any congestion of heavy horses as it is to the accumulation of lighter animals less suited to heavy draft work. The trying out of the Shire horse, therefore, with this end in view, as well as the continuation of breeding work with other heavy classes, should do something to stimulate the breeding of heavier and more profitable types.

WILL INVESTIGATE DAIRYING IN AUSTRALASIA

Mr. J. A. Ruddick, dairy commissioner for Canada, and Mr. W. A. Wilson, manager of the Saskatchewan Co-operative Creameries, and president of the Canadian Produce Dealers Association, have been appointed by the Federal Government to study the dairy industry in New Zealand and Australia. They left Vancouver on January 26, and are spending four or five weeks in New Zealand, and about a fortnight in Australia. Subjects outlined for study include milk production, manufacturing of both butter and cheese, and the system of grading, marketing and shipping.

In the announcement of the appointments it is stated that a study of the status of Canadian dairy products on the British market points to the need for prompt and energetic action if Canada is to make any progress on the British market or even if she is to hold her own.

The New Zealand system of grading dairy products has been for the last few years followed in the Prairie Provinces, with the result that butter from those provinces, until recently a negligible commodity of rather poor repute, is now of primary importance and commands a higher price on the British market than that from any other part of Canada. With the general introduction into Canada of this grading system and the application of some of the other methods that have helped make New Zealand and Australian dairy products famous, there would seem to be no reason why this country should not regain her former ascendency on the British market. This desired end, however, can be secured only by following the best known dairy practices with the sympathetic co-operation of the dairymen of Canada.

CANADIAN NATIONAL POULTRY RECORD ESTABLISHED

Under The Live Stock Pedigree Act, incorporation has been granted by the Dominion Minister of Agriculture to the Canadian National

Poultry Record Association, an organization formed for the purpose of providing registration for hens that qualify under the conditions laid down by the Association and approved by the Department of Agriculture.

The conditions of registration are, in brief, that the bird shall be pure bred, typical of the breed, free from standard disqualifications, with a record of 200 two-ounce eggs in a period of 52 consecutive weeks secured at an official Egg-laying Contest.

Birds and their progeny conforming to the requirements will be accepted for registration by the Canadian National Live Stock Records, in the same manner as other classes of live stock.

INTERNATIONAL GRAIN AND HAY SHOW—CANADIAN AWARDS

At the International Grain and Hay Show held at Chicago, Ill., in December, 1922, the Canadian winnings were as follows:

In the class for Hard Red Wheat open to the world, Canada won first and second prizes, Mr. R. O. Wyler of Luseland, Sask., winning the sweepstakes. Out of the first thirty-five placings in this class, Canada won nineteen made up as follows: Alberta 8; Saskatchewan 9; Manitoba 2.

In the barley (two-rowed class) Canada was first with Mr. Nick Taitinger of Claresholm, Alta., winning the first prize. Canada received three placings out of nine.

In the class for oats open to the world, Canada was first and second, Mr. J. W. Biglands, of Lacombe, Alta., winning first prize. In this class Canada received twenty-four out of thirty-five placings made up as follows: Alberta 13; Saskatchewan 7; Manitoba 2; Prince Edward Island 1; and Ontario 1.

In the alfalfa seed class, Canada was second and third, and won six out of the sixteen placings. It is perhaps worthy of note that all six persons winning placings from Canada were from Brooks, Alta.

GRADUATE SCHOLARSHIPS IN AGRICULTURE

In order to assist and encourage scientific agriculturists to better equip themselves for research work through specialist training, the Canadian Society of Technical Agriculturists announces that it will establish a number of graduate scholarships in 1923. As a beginning, it is proposed to offer five scholarships of at least five hundred dollars each, the number to be augmented as circumstances permit.

The Society will appoint a Board of Trustees for the administration of the Graduate Scholarship Fund. This board will undertake to secure donations to the Fund. A Credentials Committee charged with the selection of applicants will also be appointed. The conditions under which the proposed scholarships will be granted have not yet been announced.

LANTERN SLIDES FOR FARMERS' CLUBS

Farmers' clubs desiring to borrow sets of coloured lantern slides for use at their evening meetings may obtain them from the Natural Resources Intelligence Branch, Department of the Interior. The service is entirely free, express charges being paid both ways by the Department. Sets of slides may be borrowed for periods not exceeding two weeks and longer by special arrangement. As during the autumn and winter months the demand for slides is heavy it is desirable that requests should be made well in advance of proposed meetings. The following is a list of the sets available at present:

1.	Canada, Coast to Coast.	80
2.	Rural Canada (Agriculture) Part 1, Eastern Canada..	58
3.	Rural Canada (Agriculture) Part 2, Western Canada..	63
4.	The Resources of Nova Scotia and Prince Edward Island..	63
5.	The Buffalo..	60
6.	The Resources of New Brunswick..	66
7.	The Resources of Quebec.	47
8.	The Resources of Ontario.	78
9.	The Resources of Manitoba..	58
10	The Resources of Saskatchewan..	85
11.	The Resources of Alberta.	75
*12.	After "The Last West" What?..	14
*13.	Canada's Industrial Backbone (Agriculture). ..	13
*14.	Hitching Waggons to a Star (Hydro-electric energy)..	43
*15	What We Owe to our Forests..	46
16	The Resources of British Columbia..	59
17.	A set of slides on Canadian Scenery, with appropriate titles but no lecture..	57
18	Indians of Western Canada (Descriptive titles but no lecture)..	67
19.	Lumbering in Canada. ..	64
20.	Pulp and paper industry.	–

Specially prepared lectures or lecture notes accompany the several sets.

The slides marked "*" are English size, 3¼-inch x 3½-inch.

The slides not marked are American size, 3½-inch x 4.

American size sets contain from 60 to 80 slides.

INTERNATIONAL CONGRESS ON CATTLE BREEDING, 1923

From August 29 to September 4, 1923, an International Congress on Cattle Breeding will be held at The Hague.

The purpose of this Congress is to bring together the leading persons of the various countries, government officials, scientific investigators, the leaders of organizations, as well as leading men of experience in the sphere of cattle breeding and agriculture.

The Congress will open up an opportunity for an exchange of views concerning subjects in the sphere of cattle breeding that may be considered, at the present time, as attracting the full attention of all who, owing to their work, are connected with the question of cattle raising.

The papers that will be read will furnish interesting and important particulars concerning these subjects.

A great number of countries have already promised official co-operation, while it is also certain that papers will be written by several of the most distinguished persons in the sphere of cattle breeding.

Membership gives admission to all the meetings, to participation in all the excursions and the receiving of all publications, gratis. From the latter, one comes into possession, as a member, of important contributions to the knowledge of the questions with respect to cattle breeding which may be considered as being, at the moment, the centre of interest.

Associations that become members of the Congress may nominate one or more delegates, with the understanding that for each delegate a membership contribution is due. That contribution has been fixed at 12 guilders.

Associations or private persons, who are able to do so, are invited to support the Congress financially by becoming donors. Donors contribute a sum of at least 100 guilders and have the same rights as members, though an association that becomes a donor, is able to nominate two delegates.

The secretary is H. G. A. Leignes Bakhoven, Leeuwarden, Holland.

NEWS ITEMS AND NOTES

It is announced that the World's Dairy Congress and Show, particulars of which were given in the previous number of the Agricultural Gazette, will be held at Washington, October 2 to 5. Full information may be obtained by delegates and visitors by communicating with the World's Dairy Congress Association, 426 Star Building, Washington, D.C., U.S.A.

The Dominion Department of Agriculture has taken a further step towards the eradication of tuberculosis in cattle. By an Order in Council of December 11, 1922, eradication by prescribed districts will be undertaken by the Health of Animals Branch. The Department is prepared to apply quarantine to restricted areas on the request of a provincial government, and to test cattle for the disease. The quarantine will be applied, insofar as bovine tuberculosis is concerned, under such conditions as will prevent contact with cattle from outside. Owners of the cattle within the area will be required to assist the veterinary inspectors by giving such help as may be reasonably demanded. Testing will be performed by accredited veterinarians. Compensation up to two-thirds the appraised value will be paid for such reactors as are destroyed. Provision is made for saving for breeding purposes valuable animals that react to the test by segregation under what is known as the "Bang system," this being virtually a quarantine from which only the newly born calves may be saved and returned to the healthy herd.

Pursuant to the application of the Minister of Agriculture of the Province of Manitoba, the municipalities of Dufferin, Thompson and Roland have by proclamation been set apart as a restricted area for the eradication of bovine tuberculosis under the provisions of The Animal Contagious Diseases Act.

A modification of policy in the accredited herd system instituted for the eradication of tuberculosis in pure-bred cattle, is announced by the Veterinary Director General. In the case of the owner of a herd fully accredited or in process of accreditation adding to his stock, the practice has been to test animals on the vendor's premises and to institute an officially conducted quarantine for sixty days on the premises of the buyer pending a retest. Commencing with January 1, 1923, the buyer will be required to assume responsibility for the careful isolation and practical quarantine of the animals during the sixty day period They will then, as before, if they pass the test be admitted into the herd.

It has been definitely decided, announces the Dairy and Cold Storage Commissioner, that the regulations relating to the grading of Canadian dairy produce for export will be put in force on April 1, 1923. After that date all butter and cheese intended for export will be graded. The regulations require that every factory shall mark the vat number on every cheese and cheese box, and the churning number on every box of butter.

An arrangement has been made with the authorities in the three provinces of Alberta, Saskatchewan and Manitoba to have one or more of the provincial butter graders in each of these provinces appointed as Dominion Dairy Produce Graders after the first of April next, when the complete system of grading for export will be put in force. These graders will be available to grade any butter being exported direct and they will be paid by fee according to the number of packages graded. It is expected that one grader will be named at each of the following provincial grading stations, namely, Winnipeg, Regina, Saskatoon, Calgary and Edmonton.

Geo. H. Barr, Chief, Dairy Division of the Dairy and Cold Storage Branch, and John Scott, Ontario Butter Grader, conducted a butter-grading competition at the annual convention of the Creamery Association held in Toronto December 12. These competitions are popular and instructive and will be continued for both cheese and butter as suitable occasions arise.

The dairying industry of Manitoba has shown a marked development during the past few years. Out of 51,000 farmers in the province, there are now 26,000 producing and shipping milk and cream. Immediately prior to the war Manitoba was an importer of dairy products, seventy carloads of butter being brought into the province in 1914; to-day her exports total 100 carloads annually.

Alberta's creamery butter production for 1922 exceeds 15,000,000 lbs., an increase of over two million pounds over 1921.

The new Dairy Building at the Ontario Agricultural College, Guelph, was officially opened by the Provincial Minister of Agriculture, the Hon. Manning Doherty, on January 9, 1923. The new building will be fully equipped with the most modern machinery to admit of adequate instruction being given in all branches of dairying, including the manufacture of butter, cheese, ice-cream, and powdered and condensed milk.

Arrangements have been made through the Department of the Interior—which administers the Migratory Bird Convention Act—for the extension to Canada of the work of the National Association of Audubon Societies. A number of provincial educational departments have agreed to co-operate with the Dominion authorities in the formation of Junior Audubon Clubs in the schools. A considerable extension of the number of members in the junior organization throughout Canada is looked for.

In order to allow Bachelors of Agriculture of the Province of Quebec to take advantage of a post graduate course established by Macdonald College, Ste. Anne de Bellevue, the Hon. Mr. Caron, Minister of Agriculture, has granted three scholarships, which will be placed at the disposal of the year graduates and previous years' graduates of each of the following agricultural schools: Macdonald, Oka and Ste. Anne de la Pocatière.

Mr. Walter M. Stewart, president of the firm of W. C. Macdonald, Registered, Incorporated, of Montreal, has also granted two scholarships: one for a graduate of the Oka Agricultural Institute, and the other for a graduate of the School of Agriculture of Ste. Anne de la Pocatière.

APPOINTMENTS AND STAFF CHANGES

Mr. L. H. Newman, Secretary of the Canadian Seed Growers' Association, has been appointed Dominion Cerealist to fill the vacancy caused by the resignation of Dr. Chas. E. Saunders.

Mr. Newman is a graduate of the University of Toronto and of the Ontario Agricultural College. He is widely known for his work with the Canadian Seed Growers' Association, and has been identified with experimental and practical agriculture for many years.

Dr. Allan Grant Lochhead, recently appointed Dominion Bacteriologist of the Experimental Farms Branch, Department of Agriculture, took his B.A. degree at McGill University in 1911, obtaining honours in chemistry, and his M.Sc. degree from the same institution in 1912.

From 1912 to 1914 he was engaged in post-graduate work in Agricultural Bacteriology at the University of Leipsic, Germany, under Prof. F. Lohnis, now of the Department of Agriculture, Washington. He passed his examinations and presented his thesis for the degree of Ph.D. at the University of Leipsic on July 29, 1914. In May of 1919, he was granted his Ph.D. degree by McGill University. For some time thereafter he lectured on bacteriology at Macdonald College, and then took up work as Research Bacteriologist with the Canadian Milk Products Company for about two years, after which he held a position as Bacteriologist Chemist with the Canadian Malt Products Company. Following this, he was appointed to the staff of the University of Alberta, where he has since been carrying on work in bio-chemistry.

Mr. R. L. Wheeler has been appointed to fill the vacancy in the position of Fruit Transportation Specialist, caused by the

promotion of Mr. George E. McIntosh to the office of Dominion Fruit Commissioner. Major Wheeler's military service comprised two years in infantry, two years as traffic officer and detachment commander of a military railway unit in France, followed by 18 months in 1919 and 1920 on the railway advisory staff of Generals Denikin and Wrangel, anti-Bolshevist leaders in South Russia.

Major Wheeler comes to the Fruit Branch from the operating Department, Canadian Pacific Railway, Winnipeg.

Mr. G. H. Berkeley, M.A. of the University of Toronto, has been appointed to succeed Dr. W. H. Rankin as Plant Pathologist-in-Charge of the field laboratory at St. Catharines, Ont.

Mr. Herbert Groh, B.S.A., who for the past two years has been in charge of plant disease inspection work in Manitoba, and who was formerly, for some years, Assistant Botanist at the Central Experimental Farm, has been appointed to a position as Botanist with headquarters at the Central Laboratory.

The development of the educational work to encourage a greater interest in the food value of dairy products, which is being conducted by the Dairy Branch under Miss Campbell's direction, has made it necessary to engage an assistant demonstrator and lecturer. Miss Marie Eveline LeBlanc, who has been appointed to the position, has had training in household science at St. Paschal Normal School and at Laval University, and acted as Superintendent of the Cercle de Fermieres, Quebec.

Mr. William Gibson, at one time Superintendent of the Federal Experimental Farm at Indian Head, has been named by the Provincial Department of Agriculture as Superintendent of the Government Farm at Oliver, near Edmonton.

ASSOCIATIONS AND SOCIETIES

WESTERN CANADIAN SOCIETY OF AGRONOMY

The Western Canadian Society of Agronomy held its third annual meeting at the University of Saskatchewan, December 27-29, 1922. This society was organized in 1919 to promote the agronomic interests of the Prairie Provinces. It now numbers sixty members, from Agricultural Colleges, Experimental Farms and Provincial Departments of Agriculture.

A field meeting is held every summer in addition to the annual winter meeting. At the latter a programme of technical papers is presented and discussed. These are later published in the annual volume of proceedings. Standing committees are maintained to promote specifically the interests of the following branches: field crop experimentation, soils investigations, crop and seed technology, plant breeding, plant pathology, instruction, and extension. The success of the Society in stimulating interest in the investigation of agronomic problems lying within these fields, is reflected in the increasingly high quality and varied nature of the papers presented, and in the activities of the standing committees as shown in their reports.

Professor G. H. Cutler, in his presidential address, attempted to measure the progress of agronomy in the Prairie Provinces in terms of end results, that is, in terms of the actual improvement in general farm practice which had resulted from agronomic investigation and instruction. This point of view was shared by many of the succeeding speakers. There was, in fact, a remarkable unanimity with regard to the necessity of relating professional work in agriculture directly to the farmers' needs, and making results count in actual farm practice.

The programme included the following papers: Address of Welcome by President W. C. Murray, University of Saskatchewan, Progress in Agronomy in Western Canada, G. H. Cutler, University of Alberta; Agronomy as a Subject of Instruction, L. E. Kirk, University of Saskatchewan; Winter-Hardiness Studies in Wheat, R. Newton, University of Alberta; The District Representative as a Link in Extension Service, N. C. Mackay, Manitoba Department of Agriculture; Soluble Nitrogen as a Limiting Factor in Crop Production at Grande Prairie, W. D. Albright, Dominion Experimental Farm, Beaverlodge, Alta.; Thirty Years of Cereal Investigations in North Dakota, H. L. Walster, University of North Dakota; Agronomic Conditions in Manitoba as Revealed by the Manitoba Survey, J. H. Ellis, Manitoba Agricultural College; Lethal Factors and Mutations in Cereals, W. P. Thompson, University of Saskatchewan; Potato Diseases, G. R. Bisby, Manitoba Agricultural College; The Milling Value of Saskatchewan Wheats, C. H. Goulden, University of Saskatchewan; Water Require-

ments of Crops, W. H. Snelson, Dominion Irrigation Experimental Station, Brooks, Alta.; Methods of Keeping Records of Cereal Breeding Investigations, J. B. Harrington, University of Minnesota; Experimental Methods with Special Reference to Uniformity of Descriptive Terms, G. P. McRostie, Central Experimental Farm, Ottawa; Soil Moisture Studies at the Dominion Experimental Farm, Swift Current, Saskatchewan, S. Barnes, Swift Current.

The University of Alberta was selected for the next annual meeting, and the following officers were elected for 1923: President, W. C. McKillican, Experimental Farm, Indian Head, Sask.; Vice-President, Manley Champlin, University of Saskatchewan; Secretary-Treasurer, J. D. Newton, University of Alberta. Committee: J. H. Ellis, Manitoba Agricultural College; W. D. Albright, Dominion Experimental Farm, Beaverlodge, Alta.

British Columbia Berry Growers' Association.—President and Manager, H. M. Eddie; Secretary-Treasurer, A. P. Peacock, Head Office, 103-5 Yorkshire Building, Vancouver, B.C.

Manitoba Horse Breeders' Association.—President, J. W. Reid, Brandon; Secretary, W. I. Smale, Brandon.

Manitoba Cattle Breeders' Association.—President, J. R. Hume, Souris; Secretary, W. I. Smale, Brandon.

Manitoba Sheep Breeders' Association.—President, John Strachan, Pope; Secretary, W. I. Smale, Brandon.

Manitoba Swine Breeders' Association.—President, Kenneth McGregor, Brandon; Secretary, W. I. Smale.

Veterinary Association of Saskatchewan.—Officers for 1923: President, Dr. N. Wright, Saskatoon, Sask.; Vice-President, Dr. J. M. Fawcett, Regina; Secretary-Treasurer and Registrar, R. G. Chasmar, V.S., Hanley, Sask.

Dairymen's Association of Eastern Ontario.—President, W. L. Newman, Lorneville, Ont.; 1st Vice-President, W. H. Olmstead, Leonard; Secretary, T. A. Thompson, Almonte; Treasurer, J. R. Anderson, Mountain View, Ont.

Quebec Pomological and Fruit Growing Society.—Hon. President, C. E. Petch; President J. R. Marshall, Abbotsford; Secretary Treasurer, Peter Reid, Chateauguay, Que.

Canadian Sheep Breeders' Association.—Secretary, R. Wade, Department of Agriculture, Toronto, Ont.

Entomological Society of Ontario.—Secretary, A. W. Baker, Ontario Agricultural College, Guelph, Ont.

Beekeepers' Association of British Columbia.—President, Lynn Browne, Vancouver; Secretary, John Brooks, 654 24th Avenue W., Vancouver, B.C.

United Farmers of Manitoba.—President, Colin H. Burnell, Oakville; Vice-President, D. G. McKenzie, Brandon; Secretary, W. R. Wood, Winnipeg.

Dairymen's Association of Western Ontario.—President, R. Johnston, Princetown; 1st Vice-President, H. Mannell, Woodstock; Secretary-Treasurer, Frank Herns, London.

Ontario Beekeepers' Association.—Officers for 1923: President, E. T. Bainard, Lambeth; Secretary-Treasurer, F. Eric Millen, Ontario Agricultural College, Guelph, Ont.

Maritime Beekeepers' Association.—Officers for 1923: President, H. G. Miller, Fredericton, N.B.; Secretary-Treasurer, E. D. Craig, Experimental Farm, Kentville, N.S.

Manitoba Potato Growers' Association.—Secretary, J. R. Almey, Agricultural Extension Service, Legislative Building, Winnipeg, Man.

United Seed Growers, Ltd., Penticton, B.C.—Secretary, F. W. King, Kaleden, B.C.

Maritime Poultry and Pet Stock Association.—President, S. E. McKie; Secretary-Treasurer, A. Vye Gibson, Moncton, N.B.

Dominion Bantam Association.—President, Victor Barber, Toronto, Ont.; Secretary-Treasurer, J. T. Isbell, 39 Woolfrey Ave., Toronto.

Ontario Beet Growers' Association.—President, H. J. French, Dresden, Ont.; Secretary-Treasurer, J. L. Dougherty, Chatham, Ont.

Canadian National Poultry Record Association.—President, Dr. Robert Barnes, Ottawa; 1st Vice-President, Dr. Sylvis Lafortune, Gatineau Pointe, Que.; 2nd Vice-President, Prof. M. C. Herner, Manitoba Agricultural College, Winnipeg; Secretary-Treasurer, Ernest Rhoades, Department of Agriculture, Live Stock Branch, Ottawa.

Central Canada Veterinarian Association.—President, Dr. G. Hilton, Ottawa; Vice-President, J. A. Bean, Winchester; Secretary-Treasurer, Dr. C. H. Weaver, Ottawa.

Ontario Agricultural Experimental Union.—Officers for 1923: President, Jack Baker, Hampton; Vice-President, Wm. Elliott, Galt; Secretary, Dr. C. A. Zavitz, Treasurer, A. W. Mason, O. A. C., Guelph.

Manitoba Ayrshire Breeders' Club.—President, Geo. Steele, Glenboro; Vice-President, Wm. Braid, Oak River; Secretary, Wm. Brown, Deloraine.

Acadian Entomological Society.—President, Wm. McIntosh, St. John, N.B.; Vice-

President, Dr. W. H. Brittain, Truro, N.S.; Secretary-Treasurer, A. B. Baird, Fredericton, N.B.

United Grain Growers Limited.—Secretary, R. L. Shaw, Winnipeg, Man.; Assistant Secretary, L. M. Gaetz, Calgary, Alta.

Western Grain Dealers' Association.—President, J. Thordarson; Secretary-Treasurer, D. O. McHugh, Calgary, Alta.

Western Canada Irrigation Association.—Secretary, James Colley, Lethbridge, Alta.

Okanagan United Growers, Ltd.—Secretary-Treasurer, W. J. McDowall, Vernon, B.C.

Ontario Association of Fairs and Exhibitions.—President, Jas. F. Ault, Winchester; 1st Vice-President, A. R. G. Smith, New Hamburg; 2nd Vice President, James Mc Lean, Richmond Hill; Secretary-Treasurer, J. Lockie Wilson, Toronto.

Quebec Society for the Protection of Plants and the Canadian Branch of the American Phytopathological Society.—A joint meeting of the above societies was held in the Biology Building of Macdonald College on December 7 and 8, 1922. The invited guest was Dr. Melville T. Cook, of the State University of New Jersey, who spoke on "The Past and Future of Plant Pathology."

The officers of the Canadian Branch American Phytopathological Society elected for the year were as follows: President, Professor W. P. Fraser; Vice-President, Dr. B. T. Dickson; Secretary-Treasurer, Dr. R. E. Stone.

It was decided to hold the next annual meeting of the Canadian Branch at Queen's University, providing the necessary arrangements can be made

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

David Lubin; a study in practical idealism, by O. R. Agresti, with a recollection of David Lubin by W. R. Thayer. Boston, Little, Brown and co. 1922. 372p.

Concealing-coloration in the animal kingdom; an exposition of the laws of disguise through color and pattern: being a summary of A. G. Thayer's disclosures, by G. H. Thayer. New York, Macmillan, 1918. 260p. il. coloured plates.

Wild oxen, sheep and goats of all lands, living and extinct, by R. Lydekker. London, Rowland Ward, Ltd. 1898. 318p. il. colored plates.

A text-book of zoology, by T. J. Parker and W. A. Haswell. London, Macmillan, 1921. 816, 714p. il. 2 volumes.

One thousand American fungi; how to select and cook the edible; how to distinguish and avoid the poisonous . by Charles McIlvaine and R. K. Macadam. Indianapolis, The Bowen-Merrill co. 1902. 729p. il.

The origin of a land flora; a theory based upon the facts of alternation, by F. O. Bower. London, Macmillan, 1908. 727p. il.

Histoire des legumes, par M. Georges Gibault. Paris, Librairie horticole, 1912. 404p. il.

A textbook of botany for colleges, by W. F. Ganong. New York, Macmillan, 1921. 624p. il.

Fritz Bahr's commercial floriculture; a practical manual for the retail grower, by Fritz Bahr. New York, The A. T. De La Mare co 559p. il.

Tall bearded Iris, by Walter Stager. Sterling, Illinois, 1922. 262p. il.

History of transportation in the United States before 1860 by C. E. MacGill and a staff of collaborators. Washington, Carnegie institution of Washing, 1917. 678p

The technical control of dairy products; a treatise on the testing, analyzing, standardizing and the manufacture of dairy products, by Timothy Mojonnier, and H. C. Troy. Chicago, Mojonnier bros. co. 1922. 909p. il.

Hormones and heredity; a discussion of the evolution of adaptations and the evolution of species, by J. T. Cunningham. New York, Macmillan, 1921. 262 p.

Entomology with special reference to its ecological aspects, by J. W. Folsom. Philadelphia, P. Blakiston's son & co. 1922. 502p. il.

Animal parasites and human disease, by A. C. Chandler. New York, John Wiley & sons, 1922. 571p. il.

Rothamsted experimental station; reminiscences, tales and anecdotes of the laboratories, staff and experimental fields, 1872-1922, by Edwin Grey. 155p il.

God's green country; a novel of Canadian rural life, by E. M. Chapman. Toronto, The Ryerson press, 1922. 287p.

Analysis of milk and milk products, by Henry Leffmann. Philadelphia, P. Blakiston's son & co. 1915. 113p.

Confectioners' raw materials: their sources, modes of preparation, chemical composition

he chief impurities and adulterations, their more important uses and other points of interest, by James Grant. London, Edward Arnold & co. 1921. 173p. il.

Orchard fruit tree culture, by F. J. Fletcher. London, Benn bros. ltd. 1922. 73p. il. (Market nursery work, vol. 5).

Carnations and pinks, by F. J. Fletcher. London, Benn, bros. ltd. 1922. 68p. il. (Market nursery, work, vol. 4).

Canada; commerce and natural resources. Ottawa, Dept. of the Interior, 1922. 195p. il.

Fungoid diseases of agricultural plants, by Jacob Erikson. London, Bailliere, Tindall and Cox, 1912. 208p. il.

Nutrition de la plante; utilisation des substances ternaires, par Marin Molliard. Paris, Librairie Octave Doin, 1923. 306p. il. (Encyclopedie scientifique publiée sous la direction du Dr. Toulouse).

Researches on fungi; an account of the production, libration, and dispersion of the spores of hymenomycetes treated botanically and physically . . . by A. H. R. Buller. London, Longmans, Green & co. 1909. 287p. il.

A manual of farm grasses, by A. S. Hitchcock. Washington, The author, 1921. 175p. il.

Decorative plants, trees and shrubs, by F. J. Fletcher. London, Benn bros. ltd. 1922. 68 p. il. (Market nursery work series, Vol. 6).

Feeding, diet and the general care of children; a book for mothers and trained nurses, by A. J. Bell. Philadelphia, F. A. Davis co. 1923. 276p. il.

America's message to the Russian people; addresses by the members of the special diplomatic mission of the United States to Russia in the year 1917. Boston, Marshall Jones co. 1918. 154p.

History of manufactures in the United States, 1607-1860, by V.S. Clark. Washington, Carnegie institution of Washington, 1916. 675p.

Women in chemistry, a study of professional opportunities. New York, The bureau of vocational information, 1922. 272p. (Studies in occupations, No. 4).

History of Oregon, by C. H. Carey. Chicago, The Pioneer historical publishing co. 1922. 1016p. il.

Evolution, racial and habitudinal, by Rev. J. J. Gulick. Washington, Carnegie institution of Washington, 1905. 269p.

The co-operative movement in Jugoslavia, Rumania and North Italy during and after the world war, by Diarmid Coffey. New York, Oxford university press, 1922. 99p. (Carnegie endowment for international peace. Preliminary economic studies of the war, No. 21).

Some aspects of co-operation in Germany, Italy and Ireland, (a report) by M. L. Darling. Punjab, India, Government printer, 1922. 191p.

Agenda agricole, par G. Wery. Paris, Librairie J. B. Bailliere, 1923. 176p.

The advertiser's handbook; a book of reference dealing with plans, copy, typography, illustrations, mediums, management, etc. of advertising practice, by International Correspondence Schools, Scranton. Scranton, Pa., 1921. 445p. il.

Lessons in cookery; diet for invalids, by F. E. Stewart. New York, Rand McNally & co. 1920. 176p. (Home economic series. Book 4).

The boy with the U.S. weather men, by Francis Rolt-Wheeler. Boston Lothrop, Lee & Shepard co. 1917. 336p. il.

The law of allotments and allotment gardens (England & Wales) by E. L. Mitchell. London, P.S. King, 1922. 147p.

Monetary and banking policy of Chile, by G. Subscraseaux. Oxford, Clarendon press, 1922. 217p. (Carnegie endowment for international peace).

How life came upon the earth, by T. S. Givan. Boston, The Christopher publishing house, 1922. 120p. il.

Handbook and list of members of the National federation of fruit and potato trades' associations (incorporated) ltd. 1922. London, The association, 1922. 429p.

Hog cholera; its nature and control, by R. R. Birch. New York, Macmillan, 1922. 311p. il.

Fruit et legumes de primeur; culture sous verre et sous abris; tome II: Legumes, par J. Nanot et R. Vuigner. Paris, Librairie agricole de la maison rustique. 305p. il.

Congres de la pomme, Rennes, 4, 5, & 6 Novembre 1921. Rennes, Imprimeries reunies (societe cooperative), 1922. 355 p.

Compte rendu des travaux des centres d'experimentation. Rennes, Imprimeries reunies (societe cooperative), 1921. 263p.

Annual of the rose society of Ontario. Toronto, The Bryant press, ltd. 1918-1919, 1920, 1921, 1922.

The maintenance of the agricultural labour supply in England and Wales during the war, by J. K. Montgomery. Rome, International Institute of Agriculture, 1922. 121p.

New reptiles and stegocephalians from the upper Triassic of Western Texas, by E. C. Case. Washington, Carnegie institution of Washington, 1922. 84p. il.

The broad-sclerophyll vegetation of California; an ecological study of the chaparral and its related communities, by W. S. Cooper. Washington, Carnegie institution of Washington, 1922. 124p. il.

The analytical expression of the results of the theory of space-groups, by R. W. G Wyckoff. Washington, Carnegie institution of Washington, 1922. 180p.

North American flora, published by the New York botanical garden, Library has: Volumes, 3, 6, 7, 9, 10, 15, 16, 17, 21, 22, 24, 25, 29.

American produce exchange markets. (In Annals of the American academy of political and social science, vol. 38, No. 2, Sept. 1911.) 351p.

Pathological herbarium notes, issued by the Office of pathological collections, No. 1, 1920—No. 5, 1922.

The proteins of the wheat kernel, by T. B. Osborne. Washington, Carnegie institution of Washington, 1907. 119p.

The grasses of Hawaii, by A. S. Hitchcock. Honolulu, Bishop museum press, 1922. 230p. il. plates.

Final report from the select committee on the conditions and prospects of the agricultural industry and methods of improving the same. Sydney, Government printer, 1921. 228p. il.

Food and nutrition, including an examination of the climatic factor, prepared at the invitation of the N.S.W. board of trade, by C. E. Corlette. Sydney, Government printer 1921. 71p.

The cactaceae; descriptions and illustrations of plants of the cactus family, by N. L. Britton and J. N. Rose. Washington, Carnegie institution of Washington, 1922. 255p. il. colored plates.

Index of economic material in documents of the States of the United States; Pennsylvania, 1790-1904. Part III: rainfall to Z by A. R. Hasse. Washington, Carnegie institution of Washington, 1922.

Effects of winds and of barometric pressures on the Great Lakes, by J. F. Hayford. Washington, Carnegie institution of Washington, 1922. 133p.

Le sauvetage national par le retour a la terre. Port-au-prince, Haiti, ImprimerieAug. A. Heraux, n.d. 10p.

Law and regulations concerning plant quarantine service in Japan. Published by Imperial plant quarantine station, dept. of agriculture and commerce, Japan, 1919. 24p.

Les landschaften et leurs operations de credit hypothecaire en Allemagne (1770-1920) par M. Techerkinsky. Rome, Imprimerie de la chambre des deputes, 1922. 94p.

Native plants of Wisconsin suitable for cultivation, by William Toole, Sr. Madison, Wisconsin State horticultural society, 1922. 54p.

Regulations of the international congress on cattle-breeding to be held under the august patronage of H. M. the Queen of the Netherlands, at The Hague, from August 29 till September 4, 1923. 5p.

The Canadian banking system; a simple explanation of the banking and currency systems of Canada, by J. W. Ward. Winnipeg, Canadian council of agriculture, 1922. 15p.

Live-stock industry of the United States. Washington, Government printing office, 1922. 7p.

Teff grass; a valuable hay and pasture grass for arid and semi-arid tropical and warm-temperate regions, by Joseph Burtt-Davy. Johannesburg, The author, 1916. 36p.

Fur farming in the province of Quebec describing the most approved methods of propagating foxes and other fur-bearing animals in captivity, by E. T. D. Chambers. Quebec, 1920. 52 p. il.

Frame construction details. Chicago, National Lumber manufacturers association, 1920. 28 plates.

Papers from the Department of Marine biology of the Carnegie institution of Washington. Washington, Carnegie institution, 1922. 181p. il.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Division of Chemistry, 1921.—Interim Report of the Dominion Chemist, Frank T. Shutt, M.A., D.Sc., F.I.C. Dominion Experimental Farms.

Experimental Station, Kentville, N.S., 1921.—Interim Report of the Superintendent, W. Saxby Blair. Dominion Experimental Farms.

Steer Feeding Experiments in Prince Edward Island, 1912-1922.—By J. Clark, B.S.A., Superintendent, Experimental Station, Charlottetown, P.E.I., and B. Frank Tinney, B.S.A., Assistant. Pamphlet No. 23—New Series. Dominion Experimental Farms.

Is Cow Testing Worth While?—By A. H. White, B.S.A., Senior Dairy Promoter, Dairy and Cold Storage Branch. Pamphlet No. 24—New Series.

Fruit and Fruit Packages.—Sections of the Inspection and Sale Act, Part IX, and notes of special interest to fruit growers, shippers and dealers. Administered by the Fruit Branch, Acts Orders and Regulations No. 4.

ONTARIO

Statistics Branch.—Annual Report, 1921. Part I.—Agricultural Statistics; Part II.—Chattel Mortgages.

The Production and Marketing of Ontario Cheese.—By R. D. Colquette, B.S.A., Professor of Marketing Economics, and B. G. Jenvey, Assistant Director of Farm Surveys, Department of Farm Economics. Ontario Agricultural College. Bulletin 291.

Farm Poultry.—Bulletin 292 (Revised edition of No. 247) Poultry Department, Ontario Agricultural College.

QUEBEC

The Farm Gas Engine.—Its Operation and Adjustment. By L. G. Heimpel, Department of Agricultural Engineering, Macdonald College. Bulletin No. 78.

Fourteenth Annual Report of the Dairymen's Association and of the Dairy School of the Province of Quebec, 1921.—Supplement to the Report of the Honorable the Minister of Agriculture.

SASKATCHEWAN

Oat Production in Saskatchewan.—Contributed by the Department of Field Husbandry. Agricultural Extension Bulletin No. 14. College of Agriculture.

ALBERTA

Growing Sweet Clover.—By G. H Cutler and G. F. H Buckley; College of Agriculture, University of Alberta, Edmonton Bulletin No. 2.

BRITISH COLUMBIA

Native Flowers for Bees.—By J Davidson, F.L.S., F.B.S.E., Botanist in Charge of the Herbarium and Botanical Gardens, University of B.C.

MISCELLANEOUS

Canadian Highways and Roads.—Department of Railways and Canals, Highways Branch. Bulletin No. 1.

Progress of Canadian Highway Construction.—Report of Chief Commissioner of Highways, 1921. Bulletin No. 2. Department of Railways and Canals, Highways Branch.

Dominion Shorthorn Herd Book, 1922—Volume 39 of the Dominion Shorthorn Herd Book contains the pedigrees of Shorthorn Cattle imported and Canadian bred. Edited in the Office of the Canadian National Live Stock Records, Ottawa, and published by the Dominion Shorthorn Breeders' Association.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

THE INSTITUTE'S PUBLICATIONS

In accordance with the recommendations made by the General Assembly of May 1922, the Institute has brought about the following changes in the publication of its three regular bulletins.

The International Crop Report and Agricultural Statistics for 1923 is to be enlarged considerably. The three parts: *Production, Trade,* and *Prices* will be united so as to form a single volume of 50 pages, which will be published monthly on the Thursday nearest to the 20th of the month.

The part devoted to *Production* gives, as it were, a picture of the world-situation as to the areas and the production of the most important agricultural products (cereals, potatoes, vines, sugar, cotton, etc.). The Institute, which receives its information to a large extent telegraphically, furnishes the most recent data compared with the data corresponding for the previous year and with those for the preceding quinquennial period; besides news concerning weather, crop conditions, sowings, harvest prospects, etc. Each number of the said publication will contain detailed statistics on the number of *live stock* existing in the different countries.

The part devoted to *Trade* will comprise a series of tables containing data relative to the imports and exports of the different countries, by seasons and by months for the following products: wheat, wheat flour, rye, barley, oats, maize, rice, linseed, cotton and tea.

By consulting the tables of *Prices* the reader will be able to compare the recent prices of cereals and of cotton on the various markets of the world, with an extensive list of previous prices, thus obtaining a true knowledge of the tendencies of these markets; this comparison will be facilitated also by the index numbers of the various prices which are inserted.

The area and production of crops are now given in the crop report in acres and centals, and a separate sheet is issued with each number giving the production of wheat in bushels.

Subscribers to the *International Crop Report* and *Agricultural Statistics* will receive free during the year two summarized statements of the world's cereal requirements and supplies.

The annual subscription price is $3.00.

The *International Review of the Science and Practice of Agriculture* hitherto published monthly, will, from now on be published quarterly. Each issue will contain about 250 pages. The first number will be issued at the end of February.

Part I of the Review will include original articles by recognized authorities dealing with important agricultural problems of world-wide interest. Part II will include technical information obtained from all parts of the world. Part III will consist of notices concerning the outstanding events from the agricultural standpoint such as conferences, exhibitions, shows, etc.

The annual subscription is $3.00.

The *International Review of Agricultural Economics*, beginning with this year will be transformed from a monthly into a quarterly review. It will continue to deal with agricultural co-operation, agricultural insurance, credit, the economic and social conditions of the agricultural classes, land systems, etc., An attempt will be made to give greater variety and greater general interest to the articles by having recourse to outside contributors.

Attention might be drawn to the fact that two very valuable articles on Canadian subjects were published in recent numbers of the Review: "Rural Credits in Canada" by Professor W. T. Jackman of Toronto University, and "Co-operation for the Marketing of Agricultural Produce and the Supply of Farm Requisites in Canada," by W. E. H. Lang, of the staff of the Institute Bureau of Economic and Social Intelligence. These two articles have lately been republished as separate pamphlets.

The annual subscription for the Review is $2.00.

The subscription price for all three of the above mentioned publications taken together is $6.00.

The eleventh volume of the *International Year Book of Agricultural Legislation* has just been issued. It contains the more important legislation on agriculture enacted in the different countries in 1921. Although published in the French language only there is a lengthy analytical introduction in English which gives synopses of many of the laws given in detail in the text. The price of the volume is 30 francs.

The *International Year Book of Agricultural Statistics*, 1909 to 1921. The most complete work of its kind published; it is arranged for the use of both English and French readers. Price $2.00.

OTHER PUBLICATIONS

Commerce International du Bétail et de ses Dérivés (Statistical Tables) 136 pages, 8 francs.

Produits Oléagineux et Huiles Végétales (a statistical study of their production and trade) 443 pages, 20 francs.

The Landschaften and Their Mortgage Credit Operations in Germany, 90 pages, 3 francs.

Profit Sharing in Agriculture in Great Britain and Ireland, 24 pages, 1 franc.

SCIENCE AND PRACTICE OF AGRICULTURE

136.—The Part Played by the Rabbit and Other Domestic Animals in Protecting Man From Mosquitoes.—LEGENDRE, J., in *La Nature*, No. 2487. Paris, December 3, 1921.

There has been previous references to the role of animals in protecting man against the bites of the mosquitoes that convey malaria. Domestic animals living in the neighbourhood of human beings are attacked by *Anopheles maculipennis* in preference to the latter. The author, basing his opinion upon the observations made in collaboration with Oliveau, states that the rabbit is very useful in this connection. In many districts of France, the rabbit enclosures have been found to be infested with *Anopheles* when the stables and houses were completely free even in summer. The young rabbits are bitten in the hairless parts of their bodies, viz., the ears and muzzle.

CROPS AND CULTIVATION

147.—United States Production of Fish Scrap and Meal.—*The American Fertilizer*, Vol. LV, No. 10, p. 92. Philadelphia, Nov. 5, 1921.

According to the *Report of the Bureau of Fisheries, Department of Commerce*, the estimated production of fish and whale scrap and meal in 1920 was 130,000 tons, a material increase over previous years. Of this amount 16,898 tons are credited to the Pacific Coast States and Alaska. On the West Coast, as a result of the heavy demand for fertilizer material, more than the usual amount of scrap was used for this purpose. In the "menhaden" industry of the Atlantic Coast, the value of the Bureau's assistance in encouraging the production of fish meal has been greatly appreciated. At least 5,000 tons of meal were turned out by the producers in 1920 and considerable quantities of unground scrap are stated to have been sold to manufacturers interested in supplying stock feeds. The Bureau of Animal Industry of the Department of Agriculture has continued its hog-feeding tests, using various fish meals, and samples have been supplied to some fifteen State Experiment stations with satisfactory results. The experiments in progress include the feeding of meal with high oil content, samples without removal of natural oil with additional oil added and meal made from decomposed fish. If these tests yield satisfactory results, the producers of fish meal should be reasonably assured of markets for their product as the farmers have become acquainted with their merits. The whaling companies have recently expressed an interest in the manufacture of whale meal and have provided material for a feeding test.

Considerable quantities of fish offal and waste fish incident to the New England fisheries remain unutilized, and in some cases its disposal is an item of no little expense to the producer. Lack of a regular supply makes the operation of the larger reduction plants impracticable, and the smaller plants do not appear to be wholly satisfactory for the proper reduction of some of the raw materials in greatest abundance. The Bureau appreciates the need of solving the problems in this field and hopes to be in position to take them up in the near future.

149.—Distribution of Manganese in the Organism of Higher Plants.—BERTRAND, G., and ROSENBLATT, M., in *Comptes rendus de l'Academie des Sciences*, No. 22, pp. 1118-1120. Paris, November 29, 1921.

After having proved that manganese is of general occurrence in plants the authors endeavoured to ascertain the manner in which this metal is distributed, both in the different organs of plants, especially of the higher plants, and also in the various parts of any specimen gathered at a given growth period.

The results obtained show that a large amount of mangenese is present in the organs

that are the seat of active metabolism in the reproductive organs, leaves, young shoots and in all the organs containing chlorophyll as well as in seeds.

237.—Supplies of Organic Matter in the Soil; Research Carried Out at the Rothamsted Experimental Station (England).—Russell, E. J. (Director, Rothamsted Experimental Station), in *The Journal of the Ministry of Agriculture*, Vol. XXVIII, No. 9, pp. 779-782. London, December, 1921.

Recent experiments emphasize the importance of having ample supplies of organic matter in the soil, although some of the older agricultural chemists were inclined to the view that artificial fertilizers were the chief source of soil fertility and all that need be done was to apply them in the required amounts. Organic matter however as supplied by farmyard manure improves the conditions for the root-crops, facilitating the production of tilth and increasing the water-holding capacity of the soil. It also improves the growth of clover, and causes less variations in yield from year to year than artificial manure; further, its use involves less risk of deterioration of soil when the course of cropping is abnormal, as in the case where the field receives an insufficient amount of fertilizer, or a manurial treatment deficient in one or more essential constituents.

Comparison of Farmyard with Artificial Manures

Continuous wheat

Plot No.	Treatment	Average yield bush. per acre	Mean annual diminution bush. per acre	Percentage of relative variance ascribable to weather
2 b	Farmyard manure, 14 tons annually........	34·549	0·031	2·78
3 and 4	No manure...	12·629	0·097	6·20
5	Complete mineral manure........	14·180	0·090	5·84
6	As 5 + single ammoniacal salts....	22·581	0·141	6·01
7	As 5 + double ammoniacal salts......	31·367	0·144	5·11
8	As 5 + treble ammoniacal salts....	35·694	0·092	4·18
10	Double ammoniacal salts alone...	19·504	0·157	11·10
11	As 10 + Superphosphate..	22·046	0·219	10·32
12	As 10 + Super + Sulph Soda ...	28·319	0·181	7·28
13	As 10 + Super + Sulph Potash..	30·209	0·123	5·55
14	As 10 + Super + Sulph Magnesia......	27·765	0·231	6·38
17	Mineral alone, or double ammoniacal.......	14·510	0·092	10·16
Alternate 18	Salts alone, in alternate years ..	29·006	0·114	4·55

The following data, which represent the result of a series of experiments lasting 68 years, prove without doubt that farmyard manure is more dependable than other fertilizers, although it is not capable of giving as good yields in favourable seasons as a properly balanced mixture of artificials.

The superiority of farmyard manure to artificials is shown by two diagrams. One proves the steadiness of its effects as compared with the effects of a complete manure, phosphatic manure, and a nitrogen-potassic and phosphato-potassic manure respectively, in increasing the yields of continuous crops of barley grown from 1852-1919. The other shows the effect of farmyard manure and of artificials on clover and wheat (grain and straw) succeeding a corn crop.

A good deal of work is being done at Rothamsted and elsewhere to discover the scientific reasons for these various effects and the best way of using farmyard manure, but in the meantime there is another and far more urgent problem: how can the supply of farmyard manure or similar materials be increased?

Two general methods are being studied at Rothamsted. The first consists in reducing the wastage in making and storing farmyard manure, which is very considerable. The second consists in actually increasing the supply of farmyard manure or like substances on the farm, either by keeping more live stock, or by adopting substitutes for farmyard manure. The success attained in the experiments in progress at Rothamsted on the decomposition of straw by artificial means makes it most probable that given a proper air and moisture supply, suitable temperature, freedom from acidity and the addition of the right proportions of soluble nitrogen compounds, a substance resembling farmyard manure can be produced.

Another method of attaining the same object is by the use of green manuring, but for this to be an economic possibility it is necessary to sow a catchcrop after the harvest. Sewage can also be used and an extensive experiment, which was carried out at Rothamsted from 1918-1920, has proved that "activated sludge" gives a fertilizer of high value, very considerably better than anything yet obtained.

The Influence of Common Salt on Sugar-beets.—Hoffmann, M., in *Blatter fur Zuckerrubenbau*, Vol. 28, No. 15-16, pp. 157-162. Berlin, 1921.

Several sets of laboratory and field studies on the influence of common salt on the growth, quality, and water utilization of sugar beets as compared with results from pure sodium chloride, Glauber salt, sodium nitrate, and calcium chloride are reported.

Common salt and generally most sodium salts increased the quantity and quality of the sugar beet crop on both light and heavy soils where only light potash applications had been made and heavy sodium fertilization was practised. Glauber salt and sodium nitrate gave better results than calcium chloride. This is taken to indicate that it is the sodium of the common salt and not the chlorine which favourably influences the growth of crops.

It was found that the use of sodium reduced evaporation and increased the water-holding power of the soil. It is also thought that through an exchange of bases it is capable of rendering certain relatively insoluble nutritive salts more available to plants. When sodium salts were used, the sodium was found almost exclusively in the leaves of the plants, where it apparently displaced a certain amount of potash. An increase in the sugar content of beets also accompanied fertilization with sodium salts.

248.—On the Fixity of Characters in New Hybrid Potatoes.—SCHRIBAUX, in *Comptes Rendus des Seances de l'Academie d'Agriculture de France,* Vol. VIII, No. 4, pp. 81-82. Paris, January 1922.

Aumot, who is continuing his researches on new potato hybrids obtained from seed has found that in certain cases the qualities (characters) of the parents are intensified in the hybrids.

Many of the latter when propagated from naturally fertilized seed have proved very stable.

A hundred individuals belonging to line No. 120 (Beurre x Bolivienne 10 *bis* 1919) possess all the characters of their parents, luxuriant, strong-growing foliage, the shape and pink skin of Bolivienne 10 *bis* and the yellow pulp of Beurre.

In 1921, when the ordinary varieties produced tubers for the most part unfit for "seed," the hybrid potatoes were entirely satisfactory in this respect.

Some types were wonderfully resistant to the drought and at the same time very productive. The yield of some of the hybrids raised from seed often exceeded 1 kg. per clump; No. 90, the most prolific, produced 1·3 kg. per clump; some of the tubers weighed as much as 340 gm. each.

These results are really remarkable; they are specially striking, because in 1920, some of the hybrids proved to be immune to *Phytophthora infestans,* which shows that it is possible to obtain types uniting superior qualities with resistance to this destructive parasite.

163.—Development of Potato Tubers, Experiments Made in Colorado, U.S.A.—CLARK, C. F., in *Bulletin No.* 958, *United States Department of Agriculture,* pp. 1-27. Bibliography of 12 works. Washington, D.C., Aug. 22, 1921.

The experiments here described were carried out at the Colorado Potato Experiment Station, Greeley, during the seasons 1916-18. A few minor observations were also made in Maine in 1919 for the purpose of verifying previous conclusions as to the time of the beginning of tuber formation. While these studies could profitably be extended to cover a longer period and include a greater number of varieties and a wider range of environmental conditions, the author considers it advisable to place on record the results obtained up to the present time.

The material used for the experimental work was grown under field conditions, the cultural operations following those in general use in the locality. The minimum size of tubers saved was ½ inch. When a separation was made into marketable potatoes and culls, the division was by weight, the former including those equal to or exceeding 3 ounces and the culls those below that limit.

The statistical studies of tubers at one-week intervals showed that the greater part of those which grew to exceed ½ inch in diameter were formed at the start of tuber development. The maximum rate of growth of tubers was found to occur at the end of August or beginning of September, approximately 80 days after planting. At this time nearly ⅓ of the total period of tuber development had been completed. The differences in the sizes of the tubers in the individual hills may be attributed largely to the unequal rate of growth rather than to the difference in the age of the tubers. A small increase in the weight of tubers was found to occur after the vines had been killed by frost.

The weight of the tuber did not appear to be correlated with the length of the stolon upon which it is produced. The average data show a tendency towards a decrease in the size of the tuber on the upper stolons, though the individual plants showed considerable diversity in this respect. The greatest average weight was produced by the lower stolons in the 2-stolon and 3-stolon groups; while in the 4-stolon group the maximum production was in the second position, with a gradual decrease in the weight in the upper stolons. Larger numbers of observations are however needed to establish the laws governing these relationships.

The number and weights of tubers per hill were found to be influenced by the size and kind of sett planted. The relative influence of whole and cut setts on tuber production using the Rural New Yorker variety of potatoes has been determined and it appears

according to the data given that a slightly larger number and with one exception a larger weight of tubers per stem was obtained when whole setts were used.

The fact that the tuber producing ability of different varieties varies considerably with respect to the number and weight of tubers per hill is brought out very clearly in the diagrams showing the number and weight of tubers per hill produced in 500 hills of Rural New Yorker (average 4·5 and 860·7 gm. respectively) and 500 hills of Pearl (average 6·9 and 944 gm. respectively). A further comparison of the behaviour of different varieties under varying treatment with respect to irrigation was made. The varieties tested were Triumph, Early Ohio, Charles Downing, Russet, Burbank, Peachblow, Late Ohio, in addition to the two varieties above mentioned. The number of tubers per hill ranges from 3·8 in Rural New Yorker to 7·1 in Charles Downing. The lowest average weights per hill were produced by the two early varieties, Triumph and Early Ohio, the highest by the late variety Pearl. Apparently the application of water before tuber formation had begun, increased the number of tubers. Increasing the number of irrigations appears to have had little effect on the number of tubers; the weight per hill was however increased by each additional irrigation except where the applications were too frequent.

The experiments on different types of soil revealed the existence of a close relationship between the character of the soil and the number and weight of tubers. Fine sandy loam invariably gave the best results, the number of tubers per hill (Rural New Yorker var.) being 6·3 and weight of tubers per hill 1033·5 gm. (average 162·8) compared with clay loam, 4·9, 663·7 gm. (average 136·5) and heavy clay 3·0, 376·7 gm. (average 125·3) respectively.

253.—The Possibility of Determining Value of Seed by Biochemical Means.—NEMEC, A., and DUCHON, F., in *Comptes Rendus de l'Academie des Sciences*, Vol. 173, No. 20, pp. 933-935. Paris, November 14, 1921.

The authors have studied the relations between the vitality of seeds and their diastasic activity with a view to ascertaining the possibility of determining the agricultural value of seeds (especially their germinating capacity and energy), by a rapid and at the same time easy biochemical method offering greater advantages than the germination test which is sometimes a lengthy process, lasting 5 to 30 days (seeds of forest trees), according to the species.

They have investigated the relations of the various diastases (amylase, invertase, glycerophosphatase, lipodiastase, urease, uricase, phytoprotease and catalase of seeds), to the vitality of seeds of different species (maize, white mustard, soy-bean) varieties, and origin.

The results have shown that the action of hydrolysing diastases can survive the germinative capacity of the seed. The catalase behaves in a totally different manner; it would seem that the lost vitality of the organism is intimately connected with the impaired activity of the catalase. It is well known that this enzyme is extremely sensitive to the hydrogen ion; possibly the chemical changes taking place in the seed, which are characterized by the progressive acidification of the organism, bring about the gradual cessation of the activity of the catalase; in dead seeds this activity seems almost completely at an end. The small amount of oxygen released in this case may be attributed to the action of mineral catalysts or to the colloidal substances present in the seed.

It is evident that the activity of the catalase, as measured by the cubic centimetres of oxygen liberated, affords an excellent means of quickly and easily determining the agricultural value of seeds. The estimate can be made in a few minutes. It only remains now to fix the limits for the practical application of this vital test.

256.—Mansholt III, a Variety of Oats Resistant to Lodging.—DESPREZ, F., (Directeur de la Station experimentale agricole de Cappelle, Nord), in *Journal d'Agriculture pratique*, Year I, No. 5, p. 101. Paris, February, 1922.

The author reports the very satisfactory results he has obtained with Mansholt III. This variety of oats was obtained by selection from Victoire de Svalof by Prof. Mansholt of the Royal Netherland College of Wageningen (Holland).

Its chief characteristics are: fairly short, very thick, stiff straw; with panicle; white, plump grain like that of the Victoire variety; but distinctly larger; matures early, ripens well in good seasons, the weight per bushel is 41½ to 42½. As Mansholt III does not tiller it must be sown closer.

It is an excellent oat, very resistant to lodging; it should not be grown on poor, light soils, but it is very suited to rich, liberally manured land.

Grassland.—R. G. STAPLEDON, in a pamphlet of 19 pages, published by the University Press, Oxford, 1921.

In this paper the author compares permanent with temporary grass and mixtures with single species, and discusses improved herbage plants, rotations with grass as a pivotal crop, and the management of temporary grass.

Work with herbage plants at Aberystwyth, Wales, has shown the incompatability of certain species for growth together—rye

grass and cocksfoot (orchard grass), tall oat grass and cocksfoot, and late-flowering red clover and alsike clover being examples of this tendency. Different species compared in pure plats exhibited different growing periods, and it was noted that stock chose one species at one date and another at some other time. In March and April sheep grazed tall oat grass in preference to nearly all other grasses, while Italian rye grass and cocksfoot were preferred to perennial rye grass in April. The influence of a previous year's management on early spring productivity was demonstrated where beds of cocksfoot cut once during 1920 returned over twice as much green material during February and April, 1921, as beds cut once in 1920 for hay (June) and 7 times afterwards, and four times as much as beds cut once for hay (May) and cut 10 times afterwards.

Indigenous forage plants proved far more leafy and produced more tillers than plants from imported seed. The average number of tillers produced by plants more than one year old was as follows: Red clover, Montgomery 150, Cornish Marl 125, Canadian 68, English late-flowering 50, Chilean 30, and Italian 27; timothy, native 160, commercial 70; tall oat grass native 130, commercial 80; and cocksfoot, native 95, commercial 60. Hay from native, American, Danish, and French cocksfoot contained 38, 24, 25, and 23 per cent of leaves, respectively. The indigenous forms of all the species, except red clover, have a general tendency to flower later than the imported, some of the wild cocksfoot flowering from 10 to 20 days later.

257.—The World Production of Soya.— *Olien-Veiten en Oliezaden*, Year VI, No. 22, p. 254. Amsterdam, November, 22, 1921.

The most recent returns for the world's production of soya are as follows (in tons): China 3,352,400; Japan, 430,933: Corea, 348,000; United States, 58,000; total, 4,189,-333 tons.

In 1918, Japan absorbed 77 per cent of the Chinese production, America and Europe, 7 per cent, China, 16 per cent.

In 10 years the soya oil exported from China has risen from 25,000 tons to about 400,000 tons. Before the war, this oil was sent to England, the United States, Belgium, Japan and Russia. During the decade, the exports of soya-cake has increased from 400-500 tons to over 1 million tons.

261.—Alfalfa Production Under Irrigation, Experiments in the United States and in New South Wales.—I. Stewart, G., Alfalfa production under irrigation in *Utah Agricultural College Experiment Station, Circular* No. 45, pp. 3-48, tables VII, figs. 13. Logan, Utah, May 1921.—II. Harris, F. S., and Pittman, D. W., The Irrigation of Alfalfa, in *Ibid Bulletin* 80, pp. 3-30, Figs. 8. Logan, 1921. III. Chomley, F. G. and Chaffey, F.A., Producing Lucerne Hay Under Irrigation, in *Dept. of Agriculture New South Wales, Farmer's Bulletin No. 143*, pp. 3-22, figs. 19. Sydney, Oct. 1921.

I-II.—Field and tank experiments on the irrigation of alfalfa were conducted at the Utah Experiment Station, U.S. and apart from the general methods of cultivation employed which are described in detail the following results are worthy of special note.

The best results were obtained when irrigation water was applied in 3 to 5 heavy applications on loams or clay loams, but in 4 to 10 frequent light applications on porous soils. In these experiments the yield generally increased as the total amount of water applied increased up to 90 acre-inches (the highest amount applied), but the gain in yield from the application of more than 30 acre-inches was too small to pay for the extra labour; 25 in. applied in weekly quantities of 2·5 in. gave better results than 30 in. where 5 in. was applied each alternate week. With an equal amount of water, frequent moderate applications gave better yields than fewer heavy ones.

Where irrigation was not practised, 55 per cent of the entire yield came from the first cutting and 14 per cent from the third. Where regular quantities were applied each week, from 33 per cent to 37 per cent of the crop came from cutting I, from 37 to 39 per cent from cutting II and from 25 to 30 per cent from cutting III.

The relative yields of the different cuttings were to a certain extent changed when the water was applied at various times; but this did not affect the total annual yield consistently.

Apparently the yield was highest when the soil moisture content was kept constantly at 25 per cent.

III.—Alfalfa growing for hay has for some years become a feature of some importance on the Yanco Experiment Farm in New South Wales, and so profitable that the area has been considerably extended; there are now 120 acres under crop with an average of 6 or 7 cuts per season. Speaking generally, one irrigation for each cut has been found sufficient for the early part of the season, but later an average of two per cutting. Irrigation takes place a week before cutting; a second watering is given as soon as the hay is taken off. A big body of water is never turned on the alfalfa at one time. The head ditch is filled and then a gap is opened in the bank about half way between the check banks, allowing enough water to escape to spread from bank to bank, just covering the surface and moving forward very slowly. It should take from

6-8 hours for the water to reach the lower end of the block 6 chains away, by which time the water can be shut off at the upper end. This method is adaptable to heavy soil but on lighter soil, the flow can be somewhat faster. It is considered imperative that facilities be provided for thorough surface drainage, as water lying on alfalfa for 3 hours on a hot day will do irreparable damage to the stand.

Apart from the details with regard to irrigation methods employed in New South Wales, the author gives an interesting description of the hay machines, etc. used, and certain cultural details.

170.—The Oil-Bearing Sunflower on the "Riviera Di Ponente," Italy.—PERSICO, W. in *Costa azzurra Floreale-Agricola:* reprinted in *Bolletino dell' Associazione italiana pro Piante medicinali, aromatiche ed altre utili*, Year IV, No. 10, pp. 155-156. Milan, October, 1921.

The author recommends that the large, one-flowered, so-called Russian variety of *Helianthus annuus* should be grown as oleiferous plant in the Riviera di Ponente, as its product is quite equal to olive oil Very satisfactory trials have been made in the experiment vineyards and rosegardens of Pietralunga, where it has been found that about 20 quintals of seed per hectare may be expected. The seeds give 15 per cent of oil and 80 per cent of sunflower seed cake, or 3 quintals of oil and 16 quintals of cake per hectare. Without irrigation, some plants, 46 cm. in height and with heads 46 cm. in diameter, were obtained

The seeds of the sunflower are not only used for cakes, and in a variety of other well known ways, but also supply an excellent flour for cake-making, while the stalks furnish a silk-like fibre and an ash with a high potash content A brilliant yellow dye is obtained from the petals, and the leaves are used instead of those of *Datura Stramonium* as a remedy for asthma.

LIVE STOCK AND BREEDING

273.—Use of Stomosines in the Treatment of Infectious Diseases of Live Stock.—CENTANNI, E., in *l'Italia agricola*, Year 58, No. 12, pp. 366-368. Plaisance, December 15, 1921.

Stomosines are immunising substances discovered by the author which differ from those hitherto known (serums and vaccines). The latter have a preventive and the former a curative effect; they contain in an innocuous form the principle that destroys the micro-organisms and their poisons.

When the preparation of serums was extended to all infectious diseases, insurmountable difficulties were experienced owing to the different kinds of poisons produced by bacteria and the various ways of neutralizing them.

Bacteria are the cause of two distinct sorts of poisons, true specific toxins and aspecific endotoxins. The first are the product of the very small number of the least common bacteria consisting almost exclusively of the pathogenic agents of tetanus and diptheria; in the case of all the others, the fundamental poison causing the complex of the symptoms is an endotoxin. Since it is impossible to make immunising serums against endotoxins, it may fairly be said that a serotherapeutic has found itself disarmed in the face of most infectious diseases and is unable to intervene with any prospect of success when once the syndrome has declared itself.

In trying to discover what defensive means the organism adopts during the course of the disease, in order to free itself from these poisons and regain health, the author found that the active agent is a ferment or rather a kinase, increasing the activity of the ferments and so constituted that the endotoxins are attacked and burnt, being thus quickly reduced to inoffensive substances.

The author has given the name of "stomosine" to this kinase which he prepared and isolated by means of chemical processes, taking as his point of departure the protein-bacterial principles arising from the micro-organisms inducing the disease.

The poisons disseminated by the bacteria installed in the organism have two ways of manifesting themselves. Those carried by the blood produce the syndrome of fever and all the local troubles accompanying it (abscesses, sores, ulcers, etc.), while the others cause the complex of symptoms resulting in the irritation and inflammation of the tissues surrounding the centre of infection. As is required by this double symptomatology the action of the stomosines is also twofold, being both general and local.

Shortly after infection, which is followed by violent shivering, a rise of temperature takes place (average 1° to 1 5°C) showing that the combustion of the infected matters has begun. The temperature remains at this level for 8-10 hours and then suddenly falls (the change being accompanied by profuse sweating) to normal or nearly normal. If the effect is complete, a single injection is enough to produce a cure. Sometimes, however, it is necessary to repeat the operation two or three times to obtain the definitive results. In some of the most resistant cases, the disease becomes of a benign character.

The effect upon the local centre is similarly explained: the irritant poisons are destroyed and therefore all the symptoms of inflammation (congestion, exudations, pain) are removed, the surface becomes healthy and cicatrisation rapidly takes place.

So far stomosines have been prepared for the chief infectious diseases of cattle (epi-

zootic foot-and-mouth disease, diarrhoea in calves, polyarthritis and septic pneumonia); of pigs (swine fever, septicaemia, paratyphus and measles); of horses (equine adenitis, colt polyarthritis) and of poultry (fowl cholera and avian pest.)

Even where the pathogenic agent is an invisible virus that cannot be cultivated, the effect of the stomosines is satisfactory, probably because also under such a form the actual toxic factor is an intermediate poison of the nature of an endotoxin This is the case with the virus of epizootic foot-and-mouth disease, swine fever and avian pest; all these diseases and especially swine fever have proved amenable to stomosine treatment.

Stomosines are agents of an essentially curative character; as soon as they are introduced into the organism, they find themselves in the presence of poisons and bacteria which they attack and render powerless as described above. If, as in the case of preventive infection in a healthy organism, they encounter no pathological element, they remain in the circulatory system, but their power decreases somewhat rapidly in the course of a few days.

Their true use is to effect a cure, and they act even if introduced when the disease is in full development, or actually far advanced, but to obtain a more certain result, they should be employed as soon as the malady first declares itself. If an outbreak of epizootic disease occurs in a stable not only the first animal attacked should be treated but also all the animals that have been in contact with it, in order to interrupt the incubation of the disease or prevent its occurrence.

Should the disease have made its appearance in the neighbouring stables, a general preventive treatment must at once be begun in all the threatened stables without waiting for it to assume an epidemic form. In order to prolong the protection, seeing that the immunisation is not of very long duration, the injection ought to be repeated on an average every fortnight, as long as any danger threatens; in this way the owner may be sure that his stock will entirely escape infection or that the disease will assume a benign form in any of the animals attacked.

Stomosine is supplied in two forms, (a) liquid for immediate use, (b) as a soluble sterilized powder for keeping a long time. The average dose is 5 to 10 cc. per quintal of weight. The most effective way of using it is in the form of an intravenous injection; this induces the largest number of instantaneous crises and should be adopted for very urgent cases. In ordinary cases, since the liquid diffuses very readily, a subcutaneous injection is all that is required. The injection has never produced bad effects, for the substance of which it is composed is an elective kinase without any toxic or anaphylactic action.

178.—The Effect of Chloropicrin Fumes on Argas Reflexus.—Remy, M. P., in *Comptes Rendus de l'Académie des Sciences*, Vol. 172, No. 25, pp. 1619-1624. Paris, June 1921.

Argas reflexus is a parasite causing great mortality in pigeon lofts, and sometimes producing serious affections in man. The destruction of this pest is a very difficult matter, for it can remain without food for several years and none of the insecticides hitherto used are absolutely certain in their effects. This does not apply however to the fumes of chloropicrin which have proved to be highly toxic in the case of other insects also. The author has found that if *A. reflexus* is exposed to these fumes paralysis ensues which always ends in death. No experiments on a large scale have been made but doses of 20 to 30 gm. per cubic metre seem the most effective. The fumes should be allowed to act all day and if masks are worn there is no danger in the operation. As the hatching period lasts from 8 to 15 days, a second treatment one month after the first will be necessary, in order to destroy the mites that have hatched out last.

179. The Autopyotherapeutic Treatment of Strangles.—Monbet, M., in *Revue Vétérinaire*, Vol. LXXIII, Third Series, Vol. II, pp. 338-344. Toulouse, June, 1921.

The excellent results obtained by the pyotherapeutic treatment of contagious lymphangitis in the horse suggested to the author that the same methods might be applicable to strangles which is the chief pyogenic equine disease.

The technique used was a series of autopyotherapeutic injections The pyovaccine was prepared according to the method described by Belin, in the *Bulletin de la Société Centrale de Médecine Vétérianire*, of Feb. 28, 1919, p. 73.

Injections were made into the muscles of the central region of the collar at equal distance from the mastoid-humeral, the upper edge of the collar, and the front edge of the shoulder.

The region is first shaven and then disinfected by painting with tincture of iodine.

The injection is made by means of the short needle used for intradermo-palpebral maleinage attached to a 5 or 10 cc. Pravaz syringe. The amounts used are as follows: (1) four first doses increasing from 1 cc.—1·5 cc.—2 cc.—2·5 cc. on the first four days—(2) Two doses of 2·5 cc. on the fifth and sixth days.

The experiments made on four mares showed that: strangles can be cured by autopyotherapeutics; this treatment, at all events if the technique described in this

work is adopted, is perfectly safe; it seems to check the development of specific inflamed adenoids, but has little perceptible effect upon the course of catarrhal local affections.

191.—Effect of Shelter and Temperature of the Drinking Water on the Increase in Weight of Fattening Cattle, Experiments in the United States.—POTTER, E. L. and WITHYCOMBE, R., in *Oregon Agricultural College Experiment Station, Eastern Oregon Branch Station, Bulletin* No. 183, pp. 5-11. Corvallis, Oregon, Sept., 1921.

Experiments conducted over a period of several years at the Eastern Oregon Branch Station with cattle and dairy cows have shown that fattening cattle, fed under shelter and having access to a paddock, consume a quantity of feed equal to that consumed by animals reared in the field, and the actual gain established is comparatively negligible. The results obtained with fattening dairy cows indicated no noticeable difference whatever.

As regards the effect of the temperature of the water, results obtained with cattle stock showed that the effect is practically nil both with reference to food consumption and to increase in weight.

282.—Connection Between Degree of Milling and the Composition and Food Value of Bran.—HONCAMP, F. and NOLTE, O., in *Landwirtschaftliche Versuchs-Stationen*, Vol. XCVI, pp. 121-142. Berlin. Summarized in *Biedermann's Zentralblatt*, Year I, Part 7, pp. 266-268. Leipzig, 1921.

Table I gives the result of the analyses of rye and wheat bran obtained with various degrees of milling. The authors fed these brans to lambs and determined the coefficient of digestibility for each constituent; the percentages of digestible nutrient substances given in Table II were thus obtained.

Table I.—Percentage compositions of brans obtained by different degrees of Milling.

	Organic matter	Crude protein	Pure protein	N-free extracts	Crude fats	Crude fibre	Ash
Wheat bran—							
Milling 75 per cent.... .	94·97	17·02	15·56	65·62	4·61	7·72	5·03
Milling 83 per cent..... ..	93·89	17·32	15·33	62·18	5·08	9·31	6·11
Milling 94 per cent.... .	95·28	15·28	13·21	62·62	4·28	13·10	4·72
Rye bran—							
Milling 65 per cent..... ..	96·41	15·51	13·35	74·14	3·30	3·46	3·59
Milling 84 per cent......	96·07	16·37	14·80	70·50	3·87	4·33	4·93
Milling 94 per cent......	92·52	19·04	17·08	57·87	4·99	10·62	7·48

Table II.—Percentage of digestible Nutrient Substances obtained by different degrees of Milling

	Crude Protein	Pure Protein	N-free Extracts	Crude Fats	Crude Fibre	Starch value
Wheat bran—						
Milling 75 per cent........ . ..	14·36	12·9	52·82	4·05	2·13	51·2
Milling 83 per cent.........	14·19	12·2	46·95	4·29	3·73	48·1
Milling 94 per cent.................	11·02	8·9	30·12	3·45	4·89	40·0
Rye bran—						
Milling 65 per cent..................	12·08	9·9	64·28	2·53	2·06	57·4
Milling 84 per cent.........	12·77	10·2	60·42	3·01	1·78	54·9
Milling 94 per cent..................	14·85	12·8	26·74	3·97	5·89	33·4

These data prove that the degree of milling is a good measure of the food value of a bran, the finer the milling, the lower is the value of the bran.

289.—Improvement of Dairy Cattle by Milk Control in Denmark.—FABER, H. (Agricultural Commissioner to the British Government), in *The Journal of the Ministry of Agriculture*, Vol. XXVIII, No. 7, pp. 598-607, figs. 4; No. 8, pp. 704-711, figs. 2. London, October and November, 1921.

The first Danish Milk Recording Society was instituted at Vejen, in 1895 under the name of "Vejen Kontrolfo rening." The aim of this society was to ascertain the quantity and quality of the milk yield of individual cows in order to be able to eliminate the animals that did not pay for their keep and to reserve the best cows for breeding purposes. When the Vejen Society had been working for a year, it was found that the best of the controlled cows produced a pound of butter at the cost of 6d and the poorest cow produced a pound of butter at the cost of 2s 8d.

By the law of 1902 the Danish Government made a grant not exceeding £10 to each Milk Recording Society of at least 10 members with 200 cows, on condition that the Societies

should help to form better strains of dairy cattle.

The results of the institution of Milk Control Societies were: an increase in the general average of milk production, the adoption of a more liberal feeding for cows, a selection of breeding-animals based, not as before, on external conformation alone but also on an exact knowledge of the quantity and quality of the milk produced and on the ability of the cow to transmit her character as a milk producer to her progeny.

The good results obtained by these Societies are shown by the records of those of Funen. These were founded in 1899-1900, in which year they controlled 5,467 cows, the number rising in 1915-1916 to 40,116. The average annual milk yields of all the cows (whether in milk or not) belonging to the Societies being for these two years, 6,822 lb. and 7,938 lb. respectively; the fat percentage being 3·36 and 3·55, and the butter yield 255 lb. and 323 lb. respectively.

The Danish Dairy Farmer breeds his own cattle; he adopts in-breeding or line-breeding, thereby forming families.

Family herd-books are a special feature of Danish cattle-breeding, their value depending to a great extent on the work of the milk-recording societies. These herd-books have proved that the greater the number of high yielding animals a cow can count among her ancestors, the more likely she is to transmit the quality of high yield to her offspring. The author reproduces two specimen pages of the Book of Record Sheets on which are entered not only the cow's performance but also details relating to her ancestry and progeny. The family herd-books are not drawn up by the controller of the Milk Recording Societies, but by the Agricultural Advisers appointed by the Agricultural Societies or the Joint Committees of Breeding and Milk Recording Societies. The State pays part of the salaries of these advisers.

About 1880 official herd-books were started which are to some extent based on the family herd-books. These official herd-books give the description and pedigree of the animal, as well as the milk and butter production in the case of a cow, and the performance of its female progenitors in that of a bull.

In order to find herds which not only contained prominent animals but consisted of families from which a good supply of breeding stock could be obtained for the improvement of other herds, competitions were carried out for one year at a time; later, these competitions lasted two years. The first was held in Funen in 1894-1896 and the seventh in 1913-1915. Another series was begun in Sealand in 1897. The best herds were officially recognized as "Breeding-Centres."

The results obtained at Funen were as follows: *1st biennial competition:* 7 competing herds consisting of 530 cows: average annual milk production per head 697 gallons, fat percentage 3·44—*4th competition:* 18 herds, 777 cows, 853 gallons of milk, at percentage 3·53—*7th competition:* 10 herds, 304 cows, 934 gallons of milk, fat percentage 3·83. These competitions between entire herds are a peculiarity of Danish cattle-breeding. The Government encouraged them by annual grants.

An important step forward was made when it was ascertained from the Records of the Milk Recording Societies that the capacity of yielding large quantities of milk with a high fat percentage can be transmitted through the bull to his progeny.

By the Laws on Breeding Domestic Animals (1887 and 1902) grants were made by the Government for prizes for bulls at District Agricultural Shows, under the conditions that the animals were to be kept for service in the country at least until May 1st. in the following year and that bulls 5 years old or older should be judged through their offspring. This second proviso gave rise to "Offspring Shows" which are also a special Danish feature. By this means farmers have for a number of years been encouraged to preserve good bulls for service. While in 1887, only 371 bulls were presented at the District Shows, in 1908 more than 1,200 were presented at the State Shows and as many as 250 old bulls are entered at local shows every year.

The law of 1902 offered a further grant of £750 to cattle-breeding societies "which by showing superior offspring have proved to be particularly capable of developing good strains of dairy cattle." In order to participate in this grant, the Breeding Societies must exhibit at the offspring Shows their bulls and ⅛ of the total number of their cows, and at least two bulls and 24 cows. One fourth of the cows must be between one and two years old and for ½ at least, two years' milk records must be produced. Breeding Societies have an additional claim to the grant if they have formed or are about to form tribes or families of dairy cattle producing a high yield of butter. When the law was amended in 1912, further encouragement was offered to cattle-breeding societies having many of their cows under the control of the milk-recording societies. A grant is offered for each bull belonging to a cattle-breeding society when the bull is at least 1½ years old and has been awarded certain prizes at shows; the amount of the grant varies according to the proportion of the cows belonging to the breeding society that are being reliably controlled as to their yield of milk, butter production and consumption of fodder.

When the Milk Recording Societies had worked for a considerable number of years and had on their books some 15,000 herds including 250,000 cows or about ⅕ of all the

cows in the country, a large amount of information was available.

This statistical material was worked up by the Federations of Agricultural Societies. The investigations are now carried on to a large extent by the Officers of the Provincial Federations, the Government defraying part of the cost. These records are used to determine which of the registered bulls influence the milk yield of their progeny, so that it is higher than that of the dam of the bull. Butter production is taken into special account.

Both with the Red Danish Dairy Cattle and the Jutland Breed much of the progress during recent years is due to the influence of a few bulls having remarkably strong power of transmitting higher milk yielding capacity to their progeny.

The use of milk records in the breeding of cattle both by the line-breeding and employing bulls selected as explained above, has now been carried on long enough to show definite results; this is clearly seen by comparing the yield of the herds at two different periods.

Year	Yields of milk	Fat	Yields of butter
	lb.	per cent	lb.
Red Danish Breed			
1905-1906..	8 941	3·58	356
1915-1916.	10,041	4·11	4,602
1905-1906..	9,427	3·40	356
1915-1916..	11,282	4·30	546
Jutland Breed			
1900-1901.	5,315	3 09	183
1916-1917	8,175	3·87	354
1897-1898..	5,922	3·01	196
1913-1914.	8,538	3 84	367
Shorthorns			
1901-1902...	6,864	3·62	277
1911-1912..	10,164	4·06	460

Averaging 18 herds of all three breeds during a period of 14 years, the milk yield has been increased 26 per cent and the butter production over 50 per cent. The improvement has been general throughout the country and is not confined to the stock of eminent breeders, but extends also to that of small farmers. In the opinion of MORKEBERG: "the capacity to yield much milk and the capacity to yield rich milk are two different characters, both hereditary, but inherited the one independently of the other." If this is correct, the problem is still easier for a country where a high milk yield is the main object, than for Denmark, where a large production of butter is required.

The rules for Cattle Shows vary a little in the different provinces: the author quotes as instances some of the rules for the provincial Shows held by the Associated Agricultural Societies in Funen.

AGRICULTURAL INDUSTRIES

202.—The Practical Organization of Milk Control in Belgium.—*Bulletin de la Commission Permanents du lait,* August-September, 1921, pp. 70. Brussels.

The Permanent Milk Commission gives in this Bulletin a summary of the discussions that took place between the members of the Commission appointed to consider the question of the practical control of milk. At the meeting on July 7, 1921, the following resolutions were unanimously passed by the members present.

"The Permanent Milk Commission after a thorough and careful study of the practical measures to be adopted for the organization of milk control in order to insure the purity and hygienic condition of milk which plays so important a part in the preservation of public health, has come to the following conclusions:

(1) It is most desirable that Public Administrations and Agricultural Societies should increase and encourage cow-shed competitions. It would be well to resume the keeping of herd-books.

(2) All milk control should be founded upon the veterinary inspection of cow-sheds and milch cows, in accordance with the royal decree based on the findings of the Permanent Milk Commission.

The Permanent Milk Commission is further of opinion:

(a) that with assistance and under the supervision of the public authorities, a group of milk producers should be formed of which the members should voluntarily subject their cows and cow-sheds to inspection. The milk of these cows should be tested from the hygienic, chemical and bacteriological standpoints. The producer of pure wholesome milk should receive remuneration

for this control, and this remuneration should be adequate and of a public character.

(b) that the governing bodies both official and private, of hospitals, crèches and day-nurseries, etc., should forbid the use in their institutions of all untested milk, or of any milk coming from dairy farms where the premises are not subjected at least to veterinary inspection.

(c) that the above mentioned institutions should be provided with the plant necessary for keeping milk fresh and in good condition."

205.—Storage of Potatoes, Comparative Effects of Light and Darkness.—MAUPAS, A., in *Journal d'Agriculture Pratique*, Year 85, Vol. II, No. 50, pp. 498-499. Paris, Dec. 17, 1921.

As the result of the statement made by NOFFE to the effect that it is more advantageous to store potatoes in darkness than exposed to the light, conditions otherwise being equal, PAROW made comparative experiments with the object of elucidating this question. The details of his work are given in NAGEL's report in the *Zeitschrift für Spiritus-Industrie*, Berlin. The following résumé is here made by the author.

Two lots of potatoes, of absolutely identical character, weighing 11 lb. each, were placed in a cool 48° F. dry open spot on January 11, 1918 and allowed to remain there until July 22. One of these lots was placed in an open case and consequently was exposed to light, the other was placed in a closed case, i.e. in darkness.

The potatoes were weighed and analysed at the beginning and end of the experiment and from the reports made, the following results are distinctly worthy of note.

After 6 months storage	Open case %	Closed case %
Loss on gross weight of tubers..............	17·20	14·00
Loss of starchy content of potatoes..........	21·86	15·25
Loss of sugar content of potatoes............	80·00	60·00

It is already recognized that the loss in dry matter from tubers stored in a cellar or silo from the beginning of the germination period (end of the winter) is greater than the loss resulting solely from respiration. On the contrary, light retards germination and may assist in restricting the loss of starch content which accompanies the process and results from the formation of diastases; darkness is on the other hand, useful previous to germination, that is to say, it acts only as a contradictory element as regards the losses provoked by respiratory phenomena.

Contradictory results have hitherto been obtained through not making a sufficiently clear distinction between diastatic and respiratory phenomena.

206.—Transport of Market Produce by Aeroplane.—JAUMAIN, E., in *Revue Horticole belge*, Year 2, No. 12, pp. 169-170. Huy, Dec. 1, 1921.

The author states that where it is possible to utilize an aeroplane service for the carriage of produce as at London, Paris, Brussels, Amsterdam, this form of transport is superior to the railway for high priced flowers such as orchids, lilies, roses, etc. Although the cost of air transport is comparatively high, it is certain that the flowers will reach their destination fresh and undamaged and that consequently they will fetch a higher price.

At the present time an air service for goods has been established between Brussels, Rotterdam, Amsterdam, Paris and London: the journey from Brussels to Rotterdam takes one hour 10 minutes; from Rotterdam to Amsterdam, 30 minutes; from Brussels to London, three hours 30 minutes.

PLANT DISEASES

209.—The Efficacy of Fungicidal Dusts for the Control of Wheat Smut (Tilletia Tritici).—MORETTINI, A., in *Le Stazioni sperimentali agrarie italiane*, Vol. LIV, Parts 7-10, pp. 293-315. Modena, 1921.

Prophylactic experiments against wheat smut (*Tilletia Tritici*) have been carried out since 1920 at the Casalina Agriculturists' Section of the "R. Instituto superiore agrario sperimentale" of Perugia. The object of these experiments was to test the efficacy of the time-honoured copper sulphate treatment as compared with the dry or powder method. In addition to the copper sulphate dust, "polvere Caffaro" was also used. The physical character and chemical composition of this powder seem likely to produce good results. By way of experiment the Caffaro powder was mixed with water in the proportion of 1 and ½ per cent. Its reaction being slightly acid renders superfluous the second lime-milk bath in the case of wheat seed that has been already treated by the fungicide. In the control copper-sulphate treatment, a ½ per cent solution of $Cu\ SO_4$ was used. The grain was immersed for 15 minutes, and then immediately neutralized with milk of lime. After treatment, the seeds were left to dry in the usual manner.

The powder treatment was carried out in glass balls with a capacity of 500 cc. in which the diseased wheat was placed together with the necessary amount of the fungicide and shaken for 3 or 4 minutes.

Both the copper carbonate dust and the "polvere Caffaro" were used in doses increasing from 2 to 15‰. With 2 ‰ of copper carbonate, there remained, after shaking

for 3 or 4 minutes only slight traces of the fungicide, but with larger amounts the residuum increased in proportion to the °/₀₀, even after the seed had been repeatedly immersed. With "polvere Caffaro" the residuum exceeded 3 °/₀₀. Although this powder is impalpable like the copper sulphate dust, it adheres much more closely to the seeds. Naturally the adherence of the two fungicides, when they are equally fine, depends upon the variety of wheat and its hygrometric condition. Some of the seed was treated 20 days before sowing, and the rest the day it was put in the ground. A sample of each lot of seed was taken, in order to determine its germinating capacity immediately after treatment, and at the end of some months. The same measures were adopted in the case of the seed treated with copper sulphate and "polvere Caffaro" (after soaking in water) and the results of the two fungicides were compared.

The wheat used in every case was the hybrid Passerini which had been sorted by machine and contained some crushed and damaged seeds.

In the first series of experiments the wheat was thickly dusted with the spores of *Till. Tritici*, so that the whole mass was of a brownish colour. Practically it would be difficult, if not impossible, to meet with seed infected to this extent, for the mechanical processes of winnowing and sorting partially clean the caryopsids. The experiment was, however, useful from the research standpoint.

In a second series of experiments the wheat was infected with fewer spores and the conditions more nearly resembled those that actually exist under ordinary conditions.

The principal points to be determined were: (1) the effect of the fungicides upon the germinating capacity and energy of the seed; (2) their effect upon wheat smut; (3) their influence on yield.

The following conclusions were drawn from these experiments:

(1) The usual treatment with ½ per cent copper sulphate which consisted in soaking the seeds in the solution for 15 minutes and removing the acidity of the copper sulphate by means of lime, has no perceptibly injurious effect upon germinating power or energy.

(2) The application of powder, whether copper sulphate dust or "polvere Caffaro" in the proportion of 2 to 6 °/₀₀ had the same effect upon the germinating power of the wheat. Other factors being equal, the germination was improved.

(3) In the case of wheat seeds that have been intentionally and excessively infected with the spores *Till. tritici*, treatment for 15 minutes with a ½ per cent solution of copper sulphate is more efficacious in destroying the fungus, than the application of 2-4-6 °/₀₀ of copper carbonate or "polvere Caffaro." The same applies to the strong doses, viz., those from 10 to 15 °/₀₀.

(4) On the other hand, where the wheat was less infected, though to a degree much exceeding any infection that could occur naturally, the dusting treatment is more efficacious; 3 °/₀₀ carbonate of copper having a greater effect on the fungus than spraying with copper sulphate, while 4 °/₀₀ "polvere Caffaro" is slightly less efficacious.

(5) "Polvere Caffaro" used in the proportion of 4 °/₀₀ is a little less active than copper carbonate, but does all that is required

(6) Dusting, whether with copper carbonate, or "polvere Caffaro" is equally efficacious if done on the day of sowing; it has no injurious action even if carried out eight months previously.

(7) "Polvere Caffaro" mixed with water in the proportion of ½ per cent and applied for 15 minutes behaves like a similar solution of copper sulphate and renders superfluous any neutralizing treatment with lime.

As regards the practical carrying out of the dusting treatment, whether copper sulphate or "polvere Caffaro" are used, the success achieved on a small scale by mixing the infected seed and the fungicide in little glass balls would seem to show that good results might be obtained with some adaptation of ordinary movable churns or similar apparatus, or even of simpler and cheaper appliances. The churn should be three-quarters filled with wheat and the fungicide, so that a few turns of the machine are enough to mix them thoroughly. Such an apparatus can be worked by machinery like the sorters used in the mechanical sorting of seeds. In the case of small quantities of wheat, use can be made of little barrels containing less than 1 hectolitre and with an opening allowing the wheat to be quickly introduced and removed. The wheat and the fungicide can be thoroughly mixed by simply rolling the barrel.

The author is, however, of opinion that further experiments are required, both for determining the efficacy of fungicidal dusts in preventing the attacks of *Till. tritici*, and for testing the best apparatus for carrying out the treatment.

215.—Artificial Production of "Tipburn" of Potatoes.—FENTON, F. A., and RESSLER, I. L. in *Science*, New Series, Vol. LV, No. 1411, p. 54. Utica, N.Y., Jan. 13, 1922.

Experiments conducted at the Iowa Experiment Station have shown that the Rhynchote *Empoasca mali* (potato leaf-hopper) is the factor concerned with the production of "tipburn" or "hopperburn" of the potato. Emulsions were made by crushing a large number of adults of both sexes in water and small quantities injected into the leaves of potato plants; in a few days the injury was apparent, similar to, if not

identical with "tipburn." Difficulty was experienced in introducing large amounts of the emulsion into the leaf tissue, but enough was injected to induce the change. When the emulsion was placed on the leaf and the tissue pricked with a fine needle negative results were obtained. Emulsion made from crushed nymphs failed to cause damage except in a few cases, and even then it was not pronounced.

That these insects contain some toxic substance was further demonstrated by placing the residue left over from the insects after the emulsion had been poured off on leaf petioles and then inoculated by means of a fine scalpel. In every case a lesion was produced, the tissue at these points first turning yellow and then brown. Later the cells collapsed, leaving a fairly large scar.

Although Bordeaux mixture is toxic to the nymphs, it works comparatively slowly so that by keeping a leaf sprayed with this compound colonized by live nymphs, "tipburn" was produced. This would appear to show that Bordeaux mixture does not prevent "tipburn" by its action on the leaf but rather by its action on the insect.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

144.—**The World's Nitrogen Products.**—*Journal of the Society of Chemical Industry*, Vol. XL, No. 15, pp. 285-287. London, August 15, 1921.

145.—**The Condition of the Nitrogenous and Phosphatic Fertilizer Industries in Germany.**—LNGEWITTER, in *Chemiker-Zeitung*, Year XLV, No. 147, p. 191. Cothen, December 8, 1921.

151.—**Experimental Researches on the Factors Determining Resistance to Coo' ing in Leguminosae and on the Means Employed to Remedy This Defect.**—DE DOMINICIS, A., in *Annali della R. Scuola Superiore di Agricoltura in Portici*, *S*, II. Vol. 16, p. 31. Portici, 1920.

152.—**A Contribution to the Determination of the Cause of the Formation of Bacteroids in the Nodules of the Leguminosae.**—BARTHEL C., in *Annales de l'Institute Pasteur*, Vol. XXXV, No. 10, pp. 634-646. Paris, October, 1921.

154.—**Genetic Behaviour of the Spelt Form in Crosses Between Triticum Spelta and Triticum Sativum. The Possibility of Obtaining Synthetic Forms of Wheat by Crosses Between Two Spelts.**—LEIGHTY, C. E., and BOSHNALKIAN, S., in *Journal of Agricultural Research*, Vol. XXII, No. 7, pp. 335-364. Washington, November 1921.

157.—**Production of Varieties of Bean With Mottled Seeds.**—BLARINGHEM, L., in *Comptes Rendus de l'Academie des Sciences*, Vol. 173, No. 16, pp. 666-668. Paris, October, 1921.

159.—**Varietal Trials With Spring Wheat in North Dakota, U.S. Comparative Grain Yields and Milling and Baking Qualities.**—STOA, T. E., in *Bulletin 149, Agricultural Experiment Station, North Dakota Agricultural College*, pp. 1-55. August, 1921.

167.—**Piedmont Hemp.**—DOLCI, E., in *La France et le marché Italien, Organe de la Chambre de Commerce Italienne à Paris*, Year XXXVI, Nos. 245-247, pp. 291-293. Paris, July-September, 1921.

169.—**Giant Grasses for Paper Making in India, Africa, Australia and the West Indies.**—In *Bulletin of the Imperial Institute*, Vol. XIX, No. 2, pp. 174-189 and Vol. XIX, No. 3, pp. 271-282. London, 1921.

183.—**A Calculation of the Amount of Food Necessary for Stock, Especially When Grazing, Per 500 kg. of Live Weight.**—HOLDEFLEISS, P., in *Deutsche Landwirtschaftliche Presse*, Year XLVIII, No. 94, p. 693. Berlin, November, 1921.

192.—**The Gascon and Lauraguaise Breeds of Pigs in France.**—GIRARD, Les races Porcines meridionales, in *Revue Vétérinaire*, Vol. LXXIII, 3rd series, Vol. 11, pp. 82-95 and 466-485. Toulouse, February and April 1921.

193.—**Use of Forage Crops in the Fattening of Pigs. Experiments in the United States.**—ROBISON, W. L., in *Ohio Agricultural Experiment Station, Bulletin No. 343*, Pages 165-222, table 24. Wooster, Ohio, June, 1921.

200.—**Apple Packing Houses in the North Western Districts of the United States.**—PAILTHORP, P. R., and SAMSON, H. W., in *Farmer's Bulletin No. 1204*, United States Department of Agriculture, pp. 3-39. Washington, D.C., June, 1921.

203.—**A Method for Detecting the Admixture of Goats' Milk to the Milk of Cows.**—AUSTEN, W., in *Deutsche Schlacht und Viehhof Zeitung*, Year XXI, No. 25, p. 211. Berlin, 1921.

208.—**Red Currant Varieties Comparatively Resistant to American Gooseberry Mildew (Sphaerotheca Mors-Uvae) in England.**—SALMON, E. S., and WORMALD, H., in *The Gardner's Chronicle* (Third Series), Vol. LXX, No. 1804, p. 47. London, July 23, 1921.

226.—**The Present Position of Research in Agriculture in Great Britain and Suggestions as to the Best Methods of Application to Practical Farming.**—I. HALL, Sir A. D. (Chief Scientific Adviser and Director General of Intelligence Department, Ministry of Agriculture), The Present Position of Research in Agriculture, in *Journal of the Royal Society of Arts*, Vol. LXIX, No. 3567, pp. 300-312. London, April, 1921.—II. VOELCKER, J. A., How Best to Utilize the Results of Agricultural Research in Practical Farming, in *Journal of the Farmers' Club*, Pt. 6, pp. 109-129. London, Nov., 1921.

227.—**Report of the "Imperial Economic Botanist" Pusa, India, 1920-21, With Reference to Wheat, Tobacco, Fibre Plants, Oil Seeds, Grain, and Indigo, Including Physiological Investigations.**—HOWARD, G. L. C., in *Scientific Reports of the Agricultural Research Institute, Pusa*, 1920-21, pp. 8-20, Pl. II, bibliography of 7 works. Calcutta, 1921.

228.—**The New Service of Agricultural Ecology in Italy.**—*Nuovi Annali del Ministero per l'Agricoltura*, Year I, Part 2, pp. 395-398. Rome, December, 1921.

229.—**Experimental Researches on the Critical Period of Wheat, as Regards Rainfall in Italy.**—AZZI, G., *Nuovi Annali del Ministero per l'Agricoltura*, Year I, No. 2, pp. 299-307. Rome, December, 1921.

235.—**The Spring Awakening of Arable Land and the Choice of Agricultural Machines.**—RINGELMANN, M., in *Journal d'Agriculture Pratique*, Vol. 35, No. 7, pp. 132-135. Paris, February 19, 1921.

239.—**The Recent Conference at Rotterdam and the Future Prospects of Nitrate of Sodium.**—*Caliche*, Year III, No. 9, pp. 420-431. Santiago (Chili), December, 1921.

244.—**The Inheritance of the Character "Yellow Striping of Leaves" in the Oat.**—CHRISTIE, W., in ***Zeitschrift fur Induklive Abstammungs und Vererbunglsehre***, Vol. XXVII, Part 2, pp. 134-141. Leipzig, December, 1921.

250.—**Male-Sterility in Flax, Subject to Two Types of Segregation, Ambilateral and Unilateral.** BATESON, W., and GAIRDNER, A. E., in *Journal of Genetics*, Vol. II, No. 3, pp. 269-275. Cambridge, December 1921.,

259.—**A New Fodder Grass From Uganda, Pennisetum Polystachyum.**—In *Bulletin of the Imperial Institute*, Vol. XIX, No. 3, pp. 295-296. London, 1921.

272.—**Helenium Hoopesii, a Poisonous Plant Harmful to Stock in Utah, U.S.**—MARSH, D. W., CLAWSON, A. B., COUCH, J. F. and MARSH H., in *United States Department of Agriculture, Bulletin No. 947*, pp. 1-46. Bibliography of 13 works. Washington, D.C., Oct. 11, 1921.

278.—**Summary of Experiments on Foot-and-Mouth Disease in France.**—ROUX, E., VALLEE, H., CARRE, H. and NOCARD in *Comptes Rendus de l'Académie des Sciences*, Vol. 173, No. 23, pp. 1141-1145. Paris, December, 1921.

281.—**Hay Made From Liberally Fertilized Young Grass, a Farm-Grown Concentrated Food.**—I. NEUBAUER, in *Biedermann's Zentralblatt*, Year 4, Part 7, pp. 272-275. Leipzig, July, 1921.—II. HUITINGER, in *Deutsche Landwirtschaftliche Presse*, Year 49, No. 1, pp. 1-2 Berlin, January 4, 1922.

283.—**Colour Inheritance in Mammals and Domestic Birds.**—PORCHERET, A., in *Revue Vétérinaire*, Vol. LXXII, No. 9, pp. 541-548; No. II, pp. 680-690. Toulouse, Sept. and Nov. 1921.

285.—**Measurement of the Cutaneous Surface of the Horse.**—ROUSSY, B., in *Comptes Rendus de l'Académie des Sciences*, Vol. 174, No. 3, pp. 195-196. Paris, January 16, 1922.

288.—**The Cattle Industry of Cuba.**—NEVILLE, H. O., in *The Cuban Review*, Vol. XIX, No. 9, pp. 13-16, figs. 18. New York, August, 1921.

295.—**Experiments in Rearing Sheep and Goats in the United States.**—I. JONES, J.M., BREWER, R. A. and DICKSON, R.E. in *Texas Agricultural Experiment Station, Bulletin No. 269*, p. 13. College Station, 1920. II. MAGEE, W. T. and DARLOW, A. E. in *Oklahoma Agricultural and Mechanical College, Agricultural Experiment Station, Bulletin No. 133.* Stillwater, Okla., 1920.—III. MILLER, E. C. in *The Breeders' Gazette*, Vol. LXXI, No. 5-2095, pp. 139-140. Chicago, February 2, 1922.

304.—**Condition of Motor-Cultivation in rmany.**—I. MARTINY, in ***Mitteilungen***

der Deutchen Landwirtschaft-Gesellschafts. No. 25, pp. 391-394; No. 26, pp. 405-409 Berlin, June 18 and 25, 1921.—II. COLSMAN, *Ibidem*, No. 27, pp. 420-422. July 2, 1921.—III. CLEVE-GRAUHOF, *Ibidem*, No. 27, pp. 422-423.—IV. KAUL, W., *Ibidem*, No. 27, pp. 423-425.

315.—**Motor-Plough for Ploughing on the Flat.**—DESSAISAIX, R., in *Journal d'Agriculture Pratique*, Vol. 36, No. 38, p. 253. Paris, September 24, 1921.

331.—**Investigations on Potato Storage During the Hot Season in Western India.**—MANN, H. H. and NAGPURKAR, S. D., in *Investigations on Potato Cultivation in Western India, Bulletin No. 102* (of 1920), *Department of Agriculture*, Bombay, 1921.

333.—**Causes of Inferiority of Manila Hemp Fibres—(Musa Textilis) in Recent Consignments.**—*Bulletin of the Imperial Institute*, Vol. XIX, No. 2, pp. 127-132. London, 1921.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief indication of the contents of the more important articles in the September and October numbers of the Institute Bulletin. Persons interested in any of the articles may obtain the original bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

September

Co-operation for the Marketing of Agricultural Produce and the Supply of Farm Requisites in Canada.—34 pages. The second half of a very comprehensive article on co-operative marketing in this country. In this installment the author deals with the co-operative marketing of eggs and poultry; the co-operative marketing of fruits and vegetables; the co-operative sale of tobacco, the marketing of seed, the co-operative preserving of fruits; and the co-operative purchase of agricultural requisites in the different provinces.

Other articles in the September number are: The German Federation of Agriculture, Labourers and Employers; Co-operation in the Sale of Eggs and Poultry in Great Britain; the Swiss Peasants Union; Co-operation for the sale of Tobacco in Kentucky; The Land and Agricultural Bank of South Africa; Agricultural Undertakings of the Russian Refugees in Jugoslavia; The Legal Position of Agricultural Labourers in Germany; The Consolidation of Holdings in the Devastated Regions in France; The Distribution of Electric Energy in the Country Districts of France.

October

Agricultural Co-operative Purchasing Societies in Italy.—12 pages. The joint purchase of raw materials and of agricultural requisites—one of the most important branches of co-operation—is carried on in Italy by different types of societies: associations of a technical nature, agricultural unions, rural banks, and agricultural consortia.

The most important of these groups is the one consisting of the agricultural consortia, the development of which is in close connection with the importance assumed by the employment of machines and of chemical fertilizers in agriculture. These consortia are organized in the form of co-operative societies with limited liability usually with an area of operations restricted to a single district (*circondario*). Their purpose is to purchase directly either individually or in association with other societies or through the medium of their federation, all raw materials and means of production necessary locally for the carrying on of agriculture, exercising at the same time strict supervision, so as to guarantee the quality of the goods to the members who purchase them.

In the present article the figures and the information necessary to indicate the position reached by the agricultural co-operative consortia in 1920 are given.

The Economic Organization of Agriculture in Brazil.—32 pages. The author deals with the subject under the following heads: colonization; the "fazendas" (large agricultural undertakings run on industrial lines, usually for the production of coffee); agricultural credit; agricultural co-operation; social legislation; agricultural instruction and technical aids to agriculture.

Other articles in the October number are: The Italian National Credit Institute for Co-operation; The Italian Bank of Labour and Co-operation; Prevalence of Tenant Farming in Germany; The Result of the Agrarian Reform in Poland; Measures Taken in Poland for Bringing Waste Land under Cultivation; Allotments in France During the War.

AGRICULTURAL STATISTICS

THE WORLD'S LIVE STOCK

The following tables give the numbers of horses, cattle, sheep and swine in the different countries in the years 1911, 1914 and 1918 to 1922, including census data or those of available annual statistics. The figures for some of the countries of Europe are not strictly comparable from year to year on account of territorial changes since the war, but taken as a whole, the tables furnish bases for ascertaining the fluctuations in number of live stock during the last ten years for separate countries.

It should be observed that for some countries the data of the numbers of live stock per 1,000 inhabitants are not strictly exact, for the reason that the dates of censuses and other statistics of live stock differ from those fixed for the population returns.

In the remarks following the four tables the total numbers of live stock in the different continents in the years nearest 1911 and 1921 are given as well as the numbers per 1,000 inhabitants.

All the data used in this statement have been taken from the publications of the International Institute of Agriculture which is supplied with official live stock statistics by nearly every country.

HORSES

Thousands

Countries	1922	1921	1920	1919	1918	1914	1911	Number per 1,000 inhabitants	
								in year nearest 1921	in year nearest 1911
Europe:—									
Great Britain and Ireland	...	2,165	2,213	2,233	2,213	2,237	2,253	46·7	49·8
France	...	2,706	2,635	2,503	2,233	2,205	3,236	67·2	81·7
Belgium	...	222	205	162	...	...	262	29·8	35·3
Netherlands	...	364	...	362	378	...	327	53·2	55·9
Norway	...	...	...	...	221	182	168	83·5	70·1
Sweden	...	...	...	716	715	603	588	122·4	101·1
Denmark	576	598	602	558	545	567	...	183·0	194·1
Spain	...	...	...	594	577	525	546	27·9	27·4
Roumania	...	...	1·485	1·380	...	...	825	82·5	114·0
Greece	...	...	201	...	186	64	149	37·2	56·6
Germany	...	3,683	3,588	3,503	3,426	3,435	4,523	61·5	69·7
Switzerland	...	134	130	124	129	...	144	34·7	38·3
Czecho-Slovakia	...	...	581	...	...	...	...	42·8	...
Russia-in-Europe	...	...	17,718	...	...	25,292	24,795	177·2	179·3
America:—									
Canada	3,649	3,813	3,400	3,667	3,609	2,948	2,596	434·8	360·2
United States	19,056	19,208	19,766	21,482	21,555	20,962	20,277	181·7	220·5
Mexico	...	...	...	929	...	...	...	61·3	...
Argentina	...	...	...	...	8,823	8,324	8,894	1,014·3	1,191·0
Brazil	...	...	...	...	6,065	...	7,290	197·9	303·6
Chile	...	...	...	392	411	458	352	103·2	103·1
Asia:—									
British India	...	...	1,699	1,688	1,681	1,644	1,565	6·2	6·5
Japan	...	...	...	1,480	1,511	1,579	1,576	26·4	30·6
China	...	...	...	...	...	4,934	...	10·0	11·3
Russia-in-Asia	...	...	6,905	8,755	...	9,681	9,760	384·9	380·6
Africa:—									
Algeria	...	...	...	...	...	203	227	33·7	40·8
Egypt	...	34	33	31	30	40	51	2·6	4·3
Morocco	...	65	139	125	119	...	...	11·9	21·5
Tunis	...	...	...	79	36	35	39	37·7	20·3
South Africa	...	...	690	695	781	...	...	99·7	120·4
Australasia:—									
Australia	...	...	...	2,421	2,527	2,521	2,278	445·5	511·4
New Zealand	332	337	346	363	378	...	404	262·6	377·5

CATTLE

Thousands

Countries	1922	1921	1920	1919	1918	1914	1911	Number per 1,000 inhabitants: in year nearest 1921	Number per 1,000 inhabitants: in year nearest 1911
Europe:—									
Great Britain and Ireland		11,893	11,775	12,491	12,311	12,184	11,866	251·2	262,4
France		13,343	13,217	12,789	12,251	12,668	14,436	337·1	364,5
Belgium		1·515	1,487	1,286			1,812	203·1	244·1
Netherlands		2,063		1,969	2,049		2,027	301·5	346·0
Norway					1·050	1,146	1,134	396·6	474·0
Sweden				2,551	2,584	2,758	2,690	436·3	487·0
Denmark	2,525	2,591	2,504	2,188	2,124	2,463		792·9	817·5
Spain				3,397	3,174	2,743	2,541	159·6	127·4
Portugal		741						115·7	118·0
Italy					6,240	6,646		169·8	178·8
Roumania			4,895	4,634			2,667	262·8	368·6
Greece			660		649	331	298	122·1	113·4
Germany		16,840	16,807	16,523	18,579	21,829		281·3	310·8
Switzerland		1,425	1,382	1,433	1,531		1,443	369·0	383·4
Czecho-Slovakia			4,212					309·8	
Russia in-Europe			28,383			37,485	37,317	283·8	269·9
America:—									
Canada	9,820	10,206	9,572	10,085	10,046	6,037	6,533	1·163·5	906·6
United States	65,652	65,587	67,120	68,560	67,422	56,592	60,502	620·4	657·8
Mexico			2,163					142·7	
Argentina			27,392			25,867	28,786	3,149·1	3,854·7
Brazil					28,962		30,705	945·1	1,278·8
Chile				2,163	2,225	1,969	1,640	569·9	480·3
British Guiana			86	79	77	90	81	279·7	252·2
Dutch Guiana				10	10	8	7	95·0	74·4
Paraguay					5,500	5,249		5·500	5,832·3
Asia:—									
British India			127,119	129,591	129,876	124,965	103,595	449·9	428·8
Japan				1,345	1,307	1,387	1,405	24·0	27·3
China						21,997		36·2	50·2
Russia-in-Asia			9,490		12,609	14,567	14,305	529·1	557·8
Ceylon				1,599	1,451	1,484	1,465	336·1	356·5
Africa:—									
Algeria						1,992	1,114	176·1	200·2
Egypt		596	562	505	517	601	656	46·3	55·4
Tunis				635	254	189	191	303·2	98·8
Morocco		1,300	1,494	1,322	1,173	675		242·5	139·4
South Africa			5·975	5,575	6,852		5,797	989,8	970·5
Madagascar		7,829	7,519	7,277	7,055	5,845	4,573	2,120·6	1,450·2
Australasia:—									
Australia				12,711	12,739	11,052	11,829	2,338·0	2,655·2
New Zealand	3,323	3,139	3,102	3,035	2,869		2,020	2,444·	11,886·4

SHEEP

Thousands

Europe:—									
Great Britain and Ireland		24,274	23,404	25,119	27,063	27,964	30.480	512·8	674·0
France		9,600	9,406	9,022	9,061	14,038	16,425	239·9	414·8
Netherlands		668		437	642		889	97·7	151·8
Norway					1,207	1,327	1,398	456·5	584·7
Sweden				1,563	1,409	993	946	267·4	171·2
Denmark	442	522	539	509	470	516	727	159·7	263·3
Spain				19,337	17,735	16,128	15,726	906·8	788·2
Italy					11,754	13,824		319·9	322·0
Roumania			8,690	7,791			5,269	482·8	728·3
Greece			5,811		5,468	2,614	3,545	1,076·2	1,347·1
Germany		5,882	6,150	5,373	5,997	5,471	5,803	98·3	89·4
Switzerland		244	241	265	230		161	63·3	42·9
Czecho-Slovakia			976					71·8	
Russia-in-Europe			36,065			43,111	35,789	360·7	331·1
America:—									
Canada	3,263	3,676	3,721	3,422	3,053	2,058	2,175	419·0	301·8
United States	36,327	37,452	39,025	48,866	48,603	49,719	53,633	354·3	583·1
Mexico			1,090					71·9	
Argentina			45,309		44,855	43,225	80,401	5,208·9	10,766·3
Brazil					7,205		10,550	235·1	439·4
Chile				4,500	4,434	4,602	3,538	1,185·5	1,035·9

SHEEP—*Concluded*

Countries	1922	1921	1920	1919	1918	1914	1911	Number per 1,000 inhabitants	
								in year nearest 1921	in year nearest 1911
Asia:—									
British India			21,984	22,865	22,895	23,081	23,281	108·8	96·4
China					22,232	22,186		50·4	50·6
Russia-in-Asia			14,478		20,432	29,162		807·1	789·1
Africa:—									
Algeria						9,139	8,529	1,541·1	1,532·9
Morocco		6,600	6,710	5,080	4,194			1,332·7	767·9
Tunis				2,662	1,124	692	687	1,271·1	354·2
South Africa			26,289	28,492	29,914		30,657	5,132·2	3,797·4
Madagascar			300	221	274		295	84·6	93·5
Australasia:—									
Australia				75,554	87,086	78,600	93,004	13,896·8	20,876·2
New Zealand	22,222	23,285	23,915	25,828	26,538	24,798	23,996	13,131·5	22,407·2

SWINE

Thousands

Countries	1922	1921	1920	1919	1918	1914	1911	Number per 1,000 inhabitants	
								in year nearest 1921	in year nearest 1911
Europe:—									
Great Britain and Ireland		3,639	3,116	2,925	2,809	3,953	4,250	76·9	94·0
France		5,166	4,942	4,389	3,981	5,926	6,720	126·0	169·7
Belgium		976	977	770			1,229	100·8	165·6
Netherlands		1,519		450	600		1,260	222·1	215·1
Norway					214	228	334	81·(	139·5
Sweden				717	634	1,015	951	122·6	172·2
Denmark	1,899	1,430	1,116	716	621	2,497	1,468	437·6	532·4
Spain				4,434	4,107	2,810	2,472	208·3	123·9
Portugal			921					144·0	184·7
Italy					2,339	2,722		63·	72·3
Roumania			2,514	2,289			1,021	139·6	141·2
Germany		15,876	14,179	11,594	10,911	25,341	21,924	265·	337,7
Switzerland		639	546	465	366		570	165·4	151·4
Czecho-Slovakia			2,015					148·2	
Russia-in-Europe			12,272			12,903	12,323	122·7	89·1
America:—									
Canada	3,916	3,905	3,517	4,040	4,290	3,434	3,610	445·2	501·0
United States	57,834	56,097	59,344	74,584	70,978	58,933	65,620	530,7	713,5
Mexico			1,654					109·1	
Argentina			3,227		3,260	2,901	2,900	371·0	388·3
Chile				292	326	221	160	77·0	46·9
Venezuela			512		501			212·3	182·7
Asia:—									
Japan				470	398	332	299	8·4	5·8
China						76,8	19	101·3	175·2
Philippines				3,130	2,894	2,286	1,662	302·4	217·7
Russia-in-Asia			2,588		3,503	2,092	1,765	144·3	68·8
Africa:—									
Madagascar				321	486	666	600	282·0	190·3
Morocco		130	134	128	103			23·8	3·2
South Africa			560	724			1,082	80·9	181·1
Australasia:—									
Australia				696	914	862	1,111	128·0	249·3
New Zealand	385	350	267	235	259		349	272·5	325·7

In the International Year Book of Agricultural Statistics, published by the Institute, a series of tables are given containing a summary of the data for the principal species of live stock at the dates nearest 1911 and 1921 and a comparison of numbers compared with population and areas.

From these tables in the Year Book the world's situation with respect to the numbers of the principal species, as shown by the statistics approximate to 1921 and the resulting alterations in comparison with those approximate to 1911, alike in actual numbers, in relation to population, and to area, may be summed up as in the following table. In these tables the data for a large number of countries not mentioned in the four previous tables are included.

Species	Number of live stock according to statistics approximating 1921			Increase (+) or decrease (−) compared with statistics approximating 1911		
	Actual figures	Per 1,000 inhabitants	Per 1,000 acres	Actual figures	Per 1,000 inhabitants	Per 1,000 acres
	Million head	Head	Head	Million head	Head	Head
Horses	99·8	58·7	3·8	−10·7	− 8·6	−0·3
Cattle	510·9	295·7	18·7	+28·1	+ 4·9	+1·4
Sheep	532·2	325·9	20·0	−85·6	−63·8	−2·8
Swine	209·7	155·0	7·9	− 50·5	− 45·3	−1·7
Goats	116·8	114·9	5·7	− 9·2	−9·3	−0·2

Excepting in the case of cattle, there is obviously a decrease more or less important in all the species, in actual numbers, and in relation to those per 1,000 inhabitants and per 1,000 acres.

It is of interest to observe in detail for each species the variations from year to year in different countries and in the totals for the continents. It should be remembered that in every case where a total for a continent is mentioned, many more countries are taken into consideration than are given in the four tables above. These countries were omitted from the tables on account of lack of available data or on account of their lack of importance from the point of view of numbers of live stock.

Horses.—The table for horses shows that as regards individual countries, there have been decreases since pre-war years in nearly every country in Europe, the largest decrease being in Russia. Canada shows a steady increase and the United States a slight decrease. With respect to the number per 1,000 inhabitants, all the countries in Europe except Norway, Sweden and Spain show a decrease.

Taking the totals for continents the decrease is particularly observable in Europe, the continent having the largest number of horses: from 44,300,000 head according to statistics approximating 1911 to 38,400,000 head in the year nearest 1921.

Taking 100 as the basis of the aggregate number of horses in the years nearest 1911, the following index numbers will represent the data approximate to 1921 in each continent. Europe 86·7, North and Central America, 98·1, South America 93·3, Asia 84·0, Africa 94·8 and Oceania 102·8.

Cattle.—There are large decreases since 1914 in Germany and Russia and small decreases in the other European countries except Netherlands, Denmark and Spain. Roumania shows a considerable increase. Outside of Europe, there are large increases in Canada, the United States and Madagascar. It should be remembered that a large proportion of the cattle in India are draught animals, including buffaloes.

By continents, Asia has increased since 1911 from 163,400,000 to 182,400,000. North and Central America from 74,100,000 to 84,700,000, Africa, from 23,200,000 to 29,600,000 and Oceania from 14,100,000 to 16,100,000. In Europe there was a decrease from 127,500,000 to 122,100,000, and in South America, from 80,600,000 to 76,100,000.

Taking 100 cattle as the basis of the aggregate numbers of cattle according to statistics approximate to 1911 the following index numbers will represent the data approximate to 1921: Europe 95·8, North and Central America, 114·2, South America, 94·4, Asia 111·6, Africa 127·6 and Oceania 114·3.

The fluctuations in number per 100 inhabitants, and per 1,000 acres are as follows:

Continents	Number of cattle per 1,000 inhabitants		Number of cattle per 1,000 acres	
	At date nearest 1921	At date nearest 1911	At date nearest 1921	At date near est 1911
	Head	Head	Head	Head
Europe	276·5	285·4	50·2	52·6
North and Central America	600·1	598·1	15·7	13·7
South America	1,169·1	1,526·7	16·8	17·8
Asia	184·7	171·0	21·6	18·2
Africa	352·1	310·6	6·7	5·2
Oceania	1,959·8	2·032·9	7·6	6·7

Sheep.—In Europe there are large decreases in Great Britain, and Ireland and in France, with increases in Spain and Roumania. Canada shows an increase and the United States a large decrease from 53,600,000 to 36,300,000. The great sheep raising countries of the Southern Hemisphere except New Zealand show very large decreases since 1911. In Australia, there is a decrease from 93 to 75 millions, in South Africa from 31 to 26 millions, and in Argentina, from 80 to 45 millions.

The decrease since 1911 is characteristic of every continent as a whole except Africa where it is comparatively unimportant. In Europe the decline is from 167 to 153 millions, in North and Central America from 58 to 43 millions, in South America from 116 to 78 millions and in Oceania from 117 to 99 millions.

These fluctuations expressed in index numbers (100 = the number at the dates nearest 1911) are as follows: Europe 91·8, North and Central America 74·3, South America 67·6, Asia 97·3, Africa 102·3, and Oceania 84·5.

The changes in relation to population and area in each continent are as follows:—

Continents	Number of sheep per 1,000 inhabitants		Number of sheep per 1,000 acres	
	At date nearest 1921	At date nearest 1911	At date nearest 1921	At date nearest 1911
	Head	Head	Head	Head
Europe	347·1	374·1	63·0	68·9
North and Central America	298·9	460·0	7·9	10·7
South America	1,330·9	2,447·0	18·5	27·4
Asia	108·5	113·1	12·0	11·6
Africa	736·2	810·7	13·9	13·6
Oceania	12,200·2	17,143·0	47·1	55·8

Swine.—The number of swine in Germany has decreased since 1914 from 25 to 16 millions. There are decreases in several other countries of Europe and an increase in Spain. There is a slight increase in Canada and a decrease in the United States.

In every continent taken as a whole, decreases have occurred except in Africa. In Europe there is a reduction from 74 to 63 millions, in North and Central America from 72 to 63 millions, in Asia from 86 to 57 millions, in South America from 24 to 23 millions, and in Oceania from 1,500,000 to 1,100,000.

With the aid of index numbers the changes may be indicated as follows, taking 100 as representing the position nearest to 1911: Europe 85·1, North and Central America 87·1, South America 97·5, Asia 66·3, Africa 100·3 and Oceania 72·9.

The fluctuations relative to population and area are as follows:

Continents	Number of swine per 1,000 inhabitants		Number of swine per 1,000 acres	
	At date nearest 1921	At date nearest 1911	At date nearest 1921	At date nearest 1911
	Head	Head	Head	Head
Europe	143·2	168·8	26·0	31·2
North and Central America	435·1	570·7	11·5	13·2
South America	353·6	447·0	5·1	5·2
Asia	94·6	145·1	7·9	11·0
Africa	31·4	35·3	0·6	0·6
Oceania	132·6	215·7	0·5	0·7

NUMBER OF LIVE STOCK IN THE UNITED STATES

January 1st, 1923

Species	January 1st, 1923	January 1st, 1922
Horses.....	18,853,000	19,056,000
Mules.	5,506,000	5,467,000
Milch cows .	24,429,000	24,082,000
Other cattle..	41,923,000	41,550,000
Sheep	37,209,000	36,327,000
Swine	63,424,000	57,834,000

AREAS SOWN TO WINTER CEREALS

The following table gives the official estimates of the areas sown last autumn to winter wheat and rye compared with the previous year, for the countries which have so far reported to the Institute.

Countries	Wheat		Rye	
	1922 23	1921-22	1922 23	1921-22
	Acres	Acres	Acres	Acres
Belgium	328,000	306,000	475,000	540,000
Bulgaria .	2,073 000	1,839,000		
Finland .	22 000	22,000	578 000	578,000
France	12 989 000	11 862,000	2,149 000	2,054,000
Spain	10,175,000	9 922,000		
Latvia			658 000	583,000
Poland	2,362 000	2 408 000	11,476,000	11,163,000
Roumania	4 303 000	4 969 000		
Czechoslovakia	1 286,000	1,374 000	2 054 000	2,160,000
Canada	948 000	995,000		
United States	46,069 000	47,592,000	5 508 000	6 210,000
India	29 511 000	28 234 000		
Algeria	1 903,000	1 903,000		
Tunis	1 112,000	1,112 000		
Totals	113,081,000	112,538,000	22,898,000	23,288,00

FOREIGN CROP CONDITIONS

(Feb. 16, 1923)

United Kingdom.—The condition of winter cereals is good. The area sown to winter wheat is officially reported as 3 per cent less than that of last year. There was a great deal of rain during January and field work was being retarded.

France.—Winter wheat and oats have a satisfactory appearance. Heavy rains in the latter part of January were making field work difficult.

Belgium.—Owing to sowings being late, winter cereals were slow in development, but later the weather was favourable to growth.

Russia.—The condition of winter cereals at the commencement of the winter was reported to be generally satisfactory. Subsequently however, the weather was unfavourable.

Roumania.—The weather has been favourable and the condition of crops satisfactory, but the large reduction in the area sown to winter wheat makes it unlikely that there will be a surplus for export.

Jugo-Slavia.—Winter crops are in a generally satisfactory condition

Germany.—The weather in January was unsettled, but the winter crops were showing improvement.

North Africa—The appearance of the crops is satisfactory and moisture reserves everywhere adequate.

Italy.—The latest reports mention fine dry weather, and the crop conditions are favourable.

India.—The crop outlook generally is very favourable. There are especially good reports from the central provinces. The area of wheat is over a million acres larger than last year.

Argentina.—The corn area is 7,847,000 acres against 7,343,000 last year, but the crop has suffered greatly from the lack of rain.

IMPORTS AND EXPORTS OF WHEAT AND FLOUR

(Flour reduced to equivalent quantities of wheat)

Countries	November 1922	November 1921	Four months (August 1st to Nov. 30th) 1922	Four months (August 1st to Nov. 30th) 1921
	Bushels	Bushels	Bushels	Bushels
Exports—				
Belgium	34,000	67,000	214,000	193,000
France	...	76,000	723,000	613,000
Hungary	512,000	1,417,000	2,244,000	4,397,000
Roumania	652,000	381,000	814,000	2,035,000
Canada	60,781,000	33,106,000	128,842,000	71,986,000
United States	17,579,000	19,453,000	113,461,000	150,732,000
Argentina	5,830,000	828,000	25,979,000	5,772,000
India	1,900,000	119,000	2,535,000	1,228,000
Algeria	107,000	747,000	528,000	4,218,000
Tunis	11,000	183,000	122,000	1,467,000
Australia	1,081,000	9,992,000	7,110,000	30,643,000
Other countries (1)	5,000	71,000	30,000	294,000
Total Exports	88,492,000	66,440,000	282,602,000	273,578,000
Imports—				
Germany	2,631,000	7,082,000	21,204,000	37,746,000
Austria	1,376,000	1,636,000	4,301,000	6,794,000
Belgium	2,995,000	1,943,000	14,175,000	19,165,000
Denmark	431,000	409,000	1,509,000	2,021,000
Finland	374,000	177,000	1,281,000	1,033,000
France	...	1,190,000	a11,640,000	13,137,000
Great Britain and Ireland	18,176,000	14,998,000	71,803,000	78,644,000
Greece	1,505,000	1,193,000	4,320,000	3,708,000
Italy	4,843,000	8,907,000	23,295,000	32,552,000
Norway	647,000	678,000	2,687,000	2,166,000
Netherlands	2,189,000	1,935,000	9,844,000	8,919,000
Poland	16,000	25,000	75,000	344,000
Sweden	910,000	434,000	2,988,000	2,221,000
Switzerland	2,061,000	2,367,000	6,607,000	6,122,000
Czechoslovakia	1,222,000	845,000	4,255,000	4,863,000
Japan	1,048,000	1,963,000	3,439,000	6,476,000
Egypt	542,000	611,000	1,764,000	2,403,000
Other countries (2)	222,000	262,000	825,000	1,035,000
Total Imports	41,188,000	46,655,000	b174,372,000	229,349,000

(1) Italy and Algeria. (2) Latvia, Ceylon and Tunis. (a) Three months. (b) Not including France.

INDEX NUMBERS OF PRICE OF WHEAT

Dates	EXPORTING MARKETS: *Canada* WINNIPEG — No. 1 Manitoba	*United States* CHICAGO — No. 2 Winter	*India* KARACHI — Karachi white	*Argentina* BUEN. AIRES — Barletta	IMPORTING MARKETS: *Germany* BERLIN — Home grown	*Belgium* ANTWERP — Home grown	*France* PARIS — Home grown	*Great Britain* LONDON — Home grown	*Italy* MILAN — Home grown soft	*Netherlands* ROTTERDAM — Home grown
Average 1913	100	100	100	100	100	100	100	100	100	100
10 January 1913	92·6	103·0	102·0	90·2	100·1	100·4	100·2	99·1	105·0	..
13 January 1922	129·4	124·4	205·4	128·9	3,790·8	298·0	257·9	134·0	457·3	....
3 Nov. 1922	120·3	131·2	150·2	148·0	....	393·9	304·6	124·9	434·2	118·8
10 Nov. 1922	120·9	130·1	149·8	131·8	130,216·2	404·0	304·6	129·8	430·6	122·5
17 Nov. 1922	129·8	135·7	144·9	142·8	122,674·7	383·8	289·4	121·4	416·4	128·9
24 Nov. 1922	127·1	133·4	146·5	138·7	120,663·7	348·5	288·5	129·8	416·4	128·9
1 Dec. 1922	125·0	135·2	146·5	135·8	149·824·0	343·4	291·2	125·6	409·3	116·3
8 Dec. 1922	122·0	134·6	141·6	134·7	155·354·4	338·4	298·3	120·0	387·9	116·3
15 Dec. 1922	123·7	140·4	136·7	138·2	151·835·1	333·3	296·5	120·0	387·9	118·8
22 Dec. 1922	126·0	142·9	139·1	141·0	141·779·8	338·4	302·8	115·8	395·0	118·8
29 Dec. 1922	123·4	140·7	142·4	140·5	155·857·2	343·4	296·5	117·2	395·0	n.q.
5 Jan. 1923	121·7	132·1	139·9	137·0	167,923·6	343·4	310·0	116·7	395·0	113·8
12 Jan. 1923	123·6	133·8	141·6	136·4	195·072·9	353·5	302·8	118·8	391·5	113·8

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

Products Markets and Descriptions	5 January 1923	1 December 1922	3 November 1922
WHEAT *(cents p. 60 lbs.)*			
Canada:			
Winnipeg: n° 1 Manitoba	106	110	106
United States:			
Chicago: No. 2 Winter...	119½	122	118¾
Minneapolis: No. 1 North....	123	118	120
New York: No. 2 Winter	135	136	138½
India:			
Karachi: Karachi white.	122	123	122
Argentina:			
Buenos Aires: Barletta...	122	118	125
Germany:			
Berlin: Home grown..	112	101	
Belgium:			
Antwerp: Home grown .	121	118	136
France:			
Paris: Home grown .	160	152	159
Great Britain:			
London: English..	116	121	119
Liv. and Lond.: No. 1 Man....	139	139	141
Liv. and Lond.: No. 2 Win	139	140	139
Liv. and Lond.: Pacific	154	n.q.	146
Liv. and Lond.: La Plata	140	139	142
Liv. and Lond.: Australian .	153	n.q.	145
Liv. and Lond.: C. W. Kar....	150	147	146
Italy:			
Milan: Home grown soft .	154	149	141
Netherlands:			
Rotterdam: Home grown	121	124	125
RYE *(cents p. 56 lbs.)*			
United States:			
Minneapolis: No. 2 .	81½	79	78
Germany:			
Berlin: Home grown..	96	84	
Belgium:			
Antwerp: Home grown.	97	90	95
France:			
Paris: Home grown .	118	102	105
Netherlands:			
Rotterdam: Home grown	104	103	102

Freights and Voyages	5 January 1923	1 December 1922	3 November 1922
OCEAN RATES OF FREIGHT (WHEAT AND MAIZE). *(cents p. 100 lbs.)*			
Rumania:			
Danube to U.K..	17	21	22
Danube to Genoa... .	16	20	20
Canada:			
Canada to U.K...	18	19	15
United States:			
New York to Liverpool..	10	14	14
North. Range to U. K. cont.	16	16	11
North Range to Genoa	22	21	17
North Pacific Ports to U.K . .	38	38	37
Argentina:			
Plata (1) Down River-U.K.	27	27	24
Plata (2) Up River-U.K.	29	29	26
India:			
Karachi to U.K	28	28	27
Rangoon to U.K. (3)	34	33	26
Australia:			
Australia to U.K. .	45	48	45
COTTON FREIGHTS *(cents p. 100 lbs.)*			
United States:			
New York to Liverpool	25	25	25
New Orl. to Liverpool....	50	50	50

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 10: No. 3 May-June, 1923

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA

MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART I

DOMINION DEPARTMENT OF AGRICULTURE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

PART III

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS. PUBLICATIONS AND NOTES

PART V

THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The AGRICULTURAL GAZETTE
OF CANADA

VOL. X MAY-JUNE, 1923 No. 3

THE NAPPAN EXPERIMENTAL FARM

By W. W. BAIRD, SUPERINTENDENT

THE Dominion Experimental Farm for Nova Scotia was established in 1888 at Nappan, in the county of Cumberland, about eight miles from the border line of New Brunswick, and on the main line of the Canadian National Railway running from Montreal to Halifax. It was one of the original farms established under the Act passed by the Dominion Parliament in 1886, authorizing the establishment of a Central Farm and four branches. It was first known as the Experimental Farm for the Maritime Provinces, the activities of the farm at that time being designed to meet the needs of the three Provinces. Later, Stations were established at Charlottetown, Prince Edward Island, Kentville, Nova Scotia and Fredericton, New Brunswick, and this farm has since been called the Experimental Farm for Nova Scotia.

The original farm contained in all about three hundred acres, some forty-five of which were dyke land or marsh land and one hundred and twenty acres of upland under cultivation. The remainder was in rough unbroken land and woods From 1915 to 1918, ninety-two acres of the original wooded area were cleared and brought under cultivation, thus increasing the original upland under cultivation some 76·7 per cent. In 1919, the adjoining farm to the south comprising one hundred and twenty-five acres of marsh was purchased This farm with the newly cleared area has made a valuable addition to the experimental area and has facilitated the keeping of greater numbers of live stock. There are now two hundred and seventy-five acres of cultivated upland, about eighty acres of marsh land and one hundred and nine acres in rough pasture and woodland, making a total area of approximately four hundred and sixty-five acres.

Soil.—The soil of this farm is chiefly clay loam, with some parts gravelly, and with a subsoil varying from a heavy clay pan to gravelly clay with a limited area running from sandy to gravelly character Some seventy or eighty acres of the heaviest clay have been underdrained with most beneficial results. A marked improvement has been noted in the texture of the soil on the underdrained areas. It can be worked from two to three weeks earlier in the spring, which in Eastern Canada, where the growing season is so short, is a valuable asset. The underdraining has made the heavier clay soils much easier to work, reducing the labour of preparing a seed bed for grain. This is most in evidence in a wet season for, if the heavy clay is not well dried out and is worked when damp, it will bake very hard and a poor seed bed results.

Live Stock.—Since the establishment of other Experimental Stations in the Maritime Provinces, and more particularly the Experimental Station at Kentville, N.S., where horticultural work is the main feature, it was thought expedient to make live stock and field crops the two main activities of this farm, the surrounding country lending its character to the development of these two phases to a much greater degree than to other branches of agriculture.

During the past eight years, the improvement of the common dairy cow by the use of the pure-bred sire has received a great deal of attention. In 1910, twelve heifers born in 1909, were purchased for the experiment, the object of this experiment being to collect data on the cash value of the pure-bred dairy sire on a herd of common or mixed breeding in the increased production of the progeny as well as their proportionately greater market value. The grade foundation heifers were first bred to an Ayrshire bull. From this first Ayrshire cross, 1 A's, breeding was carried along as for pure-breds, breeding the Ayrshire crosses always to a pure-bred Ayrshire bull. The next year the foundation herd was bred to a Holstein bull, yielding the first cross Holstein 1 H's. All progeny was bred to a bull of like breeding. All heifers were bred to freshen as near two years of age as possible and for fall calving Each foundation heifer will, in her heifers, originate a family; hence her number has been incorporated into the number of all her progeny. The following diagram shows the possible progeny of each heifer in six successive years of breeding, making no allowance for losses and figuring that all progeny are females.

NOMENCLATURE OF PROGENY

First Ayrshire cross Spot 1.A. (1911)	Second Ayrshire cross Spot 1 A.1. (1913)	Third Ayrshire cross Spot 1.A.1.1 (1915)
	Second Ayrshire cross Spot 1.A.2. (1914)	Third Ayrshire cross Spot 1.A.1.2 (1916)
		Third Ayrshire cross Spot 1.A.2.1
Foundation Heifer Born 1909 Spot	First Holstein cross Spot 1.H. (1912)	Second Holstein cross Spot 1.H.1. (1914) Etc.

First Ayrshire Cross (Second Crop)

Spot 1.A.S. (1914) .... Second H.C. Spot 1.H.S.1. (1915)

Careful data have been collected on (*a*) Cost of rearing to first calving; (*b*) Cost of feeding for each lactation period; (*c*) Character and quantity of feeds for each lactation period; (*d*) Milk, fat and butter produced in each lactation period; (*e*) Profit produced in each lactation period; (*f*) Photographic records of each progeny of each foundation heifer which shows heredity as to quality, size and type.

While the experiment has not been completed, yet the data to date give some very interesting as well as valuable information. The first outstanding feature of this breeding test that impresses one is the marked influence a pure-bred sire has on the average grade herd of cows in transmitting to the progeny the breed characteristics, such as colour, size and conformation to type. These have been most marked in both Holsteins and Ayrshires. In Holsteins, colour marking has been as high as 98 per cent; in Ayrshires, 95 per cent. In breed type, Holsteins have scored 90 per cent, and Ayrshires, 85 per cent. In size, Holsteins have shown 96 per cent, and Ayrshires, 90 per cent.

As space will not permit of a detailed analysis of the results obtained from the production of the progeny compared with their dams, a short

summary will give in a general way the increased production from progeny over dams. The only fair basis of comparison is that of butter fat.

The data to date show that, in the case of first cross Ayrshires, 29.5 per cent are superior to their dams, covering a five-year period of production. In the case of second cross Ayrshires over a period of five years, 56 per cent were superior to their dams. In the case of third cross Ayrshires over a period of three years, 66.6 per cent were superior to their dams. It will be noted that a gradual increase has been obtained in each succeeding cross. In the case of first cross Holsteins covering a period of five years, 33.2 per cent were superior to dams in butter fat production. In the case of second cross Holsteins covering a period of three years, 90 per cent showed superiority to their dams.

One of the most important phases of this work is the results obtained by using a pure-bred sire of the right breed-type, having official qualifications for production in his ancestry, versus using a pure-bred sire of the right breed-type but not sufficiently qualified by official production in his ancestry. For example, bull No. 1 was one possessing good breed-type, but the official records show in his ancestry only 15 R.O.P. daughters, most of which were in the ancestry of the great grandsire. Daughters from this bull showed a decrease in milk production as well as per cent fat. The average production from the dams was 5,905 pounds milk, yielding 257.5 pounds butter-fat at a cost of 21.5 cents per pound, while the average production from their daughters was 4,315 pounds milk, yielding 164.5 pounds butter-fat at a cost of 29.5 cents per pound. Skim-milk was omitted in computing these costs per pound of butter-fat in all cases.

Bull No. 2 was one of good breed-type and had sufficient official qualifications in his ancestry to warrant a reasonably good increase in production in his progeny, having in his ancestry 114 R.O.P. daughters and 81 R.O.P. sons. Daughters from this bull back the guarantee by an increase in their production and per cent butter-fat over their dams. Their dams gave an average production of 4,647.5 pounds milk, yielding 181 pounds butter-fat at a cost of 26.5 cents per pound, while their daughters gave an average of 6,602.4 pounds milk, yielding 291.5 pounds butter-fat at a cost of 21 cents per pound. A decrease in cost of production of $5.50 per hundredweight in favour of the daughters from the bull with the qualifications of production in his ancestry is thus shown, against an increase in cost of production of $8 per hundredweight of butter-fat produced by the daughters from the bull with good breed-type but not sufficient qualifications in his ancestry to warrant a profitable improvement in progeny over dams.

The foregoing results are worthy of note from the standpoint of the breeder who is selecting his herd sire, whether he be intended for a grade herd or pure-bred herd. The application of the principle is the same, and one may expect similar results to follow such a selection.

The cost of milk production was computed over a period of nine years from the fore-mentioned grade herd, where no selection of females was made because all females were retained for experimental purposes. Consequently, this would tend to increase the cost of production as the poorer females would keep the average production low. Nevertheless, it is felt that these figures from a grade herd may be of interest and value to the breeder and feeder. The nine year average was as follows: Amount of different feeds required to produce 100 pounds milk was 37 pounds meal, 113 pounds roots, 80 pounds hay, and

35 pounds green feed at an average cost of $1.77 per hundredweight. The meal mixture was charged at $2.50 per hundredweight, roots at $3 per ton, hay at $12 per ton, green feed at $3 per ton and pasture at $2 per month.

A herd of Shorthorns, consisting of seven mature cows, two two-year old heifers, one yearling heifer and a herd bull was established at this farm during the season of 1920. The object of establishing this herd was threefold: First, to study problems relative to successful breeding and feeding of beef cattle and the application of such principles as have already been established. Second, to improve the beef stock in the district by demonstrations in breeding and development; also sale of good sires. Third, to ascertain the cost of production, which after all is one of the main factors in farming.

A foundation herd of pure-bred Guernseys made up of eight mature cows, three young females and a herd bull, was also established in 1920, the object of such being: First, to make a study of problems relating to successful breeding of pure-bred Guernseys; second, to aid in improving the breed by demonstration and sale of good sires; third, to study cost of production under present day conditions; fourth, to carry on Record of Performance work. Good progress has been made with both these herds, some very good individuals having been sold. and good individual records made. King's Blanche of Hillside made the following records in two successive years: first year, 12,230 pounds milk with an average test of 6.23 per cent, yielding 762 pounds fat; second year, 12,087.5 pounds milk with an average test of 6.2 per cent, yielding 749.42 pounds fat; making a total of 1,511.42 pounds in two 365-day lactation periods.

Sheep.—Another project carried out at this farm, bearing upon the same point of interest to the breeder as the grading up of dairy cows is the grading up of the average grade ewe by the use of pure-bred sires. In 1917, a number of average grade ewes were purchased and bred to a good ram, possessing not only good breed-type but an excellent fleece of wool. Other rams used on the progeny were equally as good. The following were the results: The grade ewes gave a wool clip that averaged six and one-quarter pounds per fleece. Their progeny yielded a wool clip that averaged eight and nine-twentieths pounds per fleece, which graded 85·6 per cent medium combing, 11·6 per cent low medium, and 2·8 per cent low combing. Their progeny in turn gave an average wool clip of eight and five-sevenths pounds per fleece, grading 85·5 per cent medium combing, 11·7 per cent low medium, and 3·4 per cent low combing, showing an increase in three years of nearly two and five-eighths pounds per fleece. To the breeder having a flock of 100 ewes, this would mean an increase in production of 262·5 pounds wool, which figured at 30 cents per pound would realize a net increase profit from the flock of $78.75.

The foregoing results are indicative of the fact that cheap sires are dear sires at any price, and that good sires with official qualifications in ancestry are cheap sires at any reasonable figure.

Swine.—Swine breeding has also received much attention at this farm, two herds being maintained, namely Yorkshires and Berkshires. The object in maintaining these herds is twofold, first to collect data on cost of production under present day conditions, and, second, to supply good breeding stock so that the stock

may be improved and greater profits realized.

Last year, the average feed cost for maintaining a herd of twelve brood sows was $407.64 or $33.97 per sow. Nine Yorkshire sows gave an average of 10·4 pigs per litter and raised an average of 8·12 at a feed cost of $2.35 per pig at six weeks of age. The average market value was $59.93 per litter or $7.32 per pig at six weeks of age. The average profit realized per sow over feed cost was $72.52. It may be well to mention that all sows except two produced two litters within the year. The cost of pork production for the same period was $8.57 per hundredweight of gain. The amount of different feeds required to produce a pound of gain was 3·6 pounds meal, 1·9 pounds roots and 1·35 pounds skim-milk. Data on cost of production will be secured over a period of years in order to strike a mean average cost of production.

Poultry.—Similar work to that of live stock is being carried on with poultry. Figures are being collected to show the value of using cockerels selected from high-producing dams. Special pedigree breeding work is also receiving careful attention and marked progress is being made.

The same maxim applies in all breeding work and is backed by figures. That is, if rapid progress is to be made in raising the standard of production, the breeder cannot afford to use sires that have not official qualifications in their ancestry to warrant or guarantee that they possess the heritable qualities that place them well above the average standard of inherited qualities possessed by the females on which they are used. Figures submitted previously in this article go to prove that when sires are used that do not possess these qualities, the per cent of inferior animals is increased. This is applicable to male or female;

Dominion Experimental Farm, Nappan, Nova Scotia.—Variety test plots of cereals at harvest time

consequently, the standard of production is not increased, and cost of production remains so high that it is impossible to expect a reasonable return for labour and money invested. Maxims: "Breed from the best to the best"; "Feed the best to the best"—and your labour will be well rewarded.

Egg-Laying Contest—The Nova Scotia Federal Egg Laying Contest was started at this farm in 1919. This is a very popular feature of the poultry work. It has been the means of stimulating a greater interest in the poultry industry. This is borne out by these facts: (1) The correspondence received at this farm enquiring for information on poultry house construction, breeding, feeding, and care and management has more than tripled since the contest started. (2) The increase in demand for bred-to-lay stock. (3) The average production from the contest for 1919-20 was 121·1 eggs per hen; in 1920-21 it was 127·7 eggs per hen, and in 1921-22 it was 138·3 eggs per hen—a gradual yet creditable increase in production. These results are indicative of progress and go to prove that the Egg Laying Contests have been a means of stimulating a greater interest in the poultry industry. That they will be of incalculable value to the industry is undoubted.

Dominion Experimental Farm, Nappan, N.S.—Variety test plots of roots.

Field Crops.—As it is important that every farmer should concern himself with the production of the soil, and as it is imperative at the present time that careful thought should be given to soil improvement and kinds of crops best suited to different sections of the country, an expansion of this work has resulted at Nappan. Data are being collected on suitable rotation of crops, cost of production, kinds of crops best suited to this district, cultural methods,

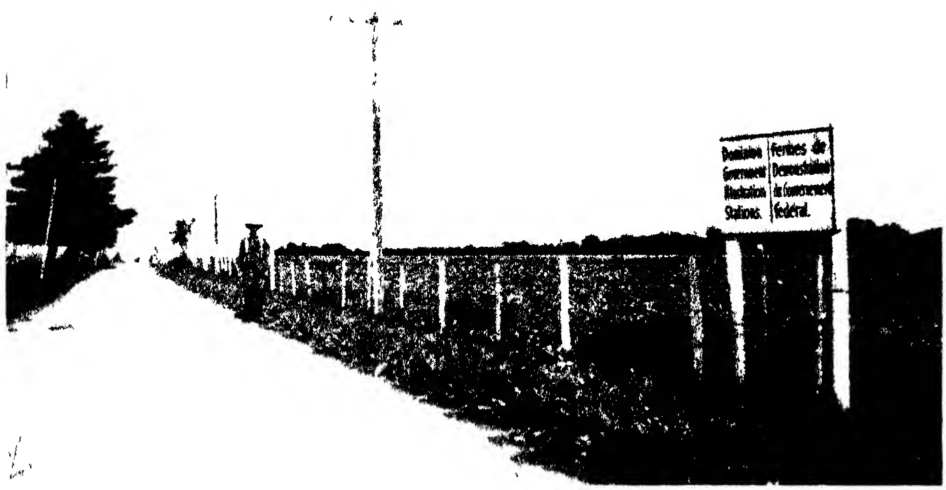
grain mixtures, fertilizer mixtures, and drainage effect. Last year, new work with marsh improvement was started, this being a very important phase in farming throughout this section, where thousands of acres of marsh-land have become non-productive or reached a state of production that is not profitable through lack of proper drainage or cultivation. Drainage is one of the biggest questions in marsh improvement, for once marshland becomes water-soaked, it is not long in becoming non-productive. In a year or two it is anticipated that sufficient figures will be available to prove that these marshes can be brought back to a profitable state of productivity.

Horticulture The horticultural division has for its work variety testing of vegetables, strawberries, bush fruits, apples and potatoes, investigating the best methods of cultivation for growing these crops, testing out spray mixtures and their effects on different crops, the more extensive work being carried on with apples, strawberries and potatoes. In apples, it has been demonstrated that there are certain commercial varieties that can be profitably grown in this district such as McIntosh Red, Grime's Golden, Golden Russett, Baxter, Fallowater, North-western Greening, Pewaukee, Yellow Transparent, Duchess, and Red Astrachan. It has also been demonstrated that Irish Cobbler, Carman No. 1 and Green Mountain potatoes are the leading varieties to meet the market demand, though there are some English varieties such as British Queen and Arran Chief that out-yield them. Strawberries have also proved to be a profitable crop for this section. The ornamentation of the home grounds has also received considerable attention, different varieties of parennials and annual flowers having been tested. Shrubs for lawns and hedges have also been grown and their possibilities well demonstrated for ornamental purposes

THE DOMINION ILLUSTRATION STATIONS IN QUEBEC

By JOHN FIXTER, Chief Supervisor

FOR thirty-six years, the Experimental Farms Branch of the Dominion Department of Agriculture has been investigating problems relating to soils, their various characters and needs, fertilizers, their qualities, composition and best methods and rates of application, soil drainage, rotation of crops, cultural methods, and best varieties to grow under conditions varying as to soil, climate and type of farming pursued.



Dominion Illustration Station at Stanbridge East, Quebec.—General view.

From this research and experiment, there has been gathered a vast accumulation of well-proven, practical results. It remained, then, to bring these results to the attention of the farmers of Canada through every possible channel, and of these there is none better than actual illustration carried out by practical, everyday farmers upon their own farms.

A system of Illustration Stations, then, was established in the different provinces, not with the view of conducting experiments thereon, but solely to illustrate and drive home the fact that increased profits were to be made from the application of already proven experimental results to commercial farming.

In 1916, Illustration Station work in the province of Quebec was begun, and at the present time, thirty-one stations are in operation, and three additional stations have been selected and will start operations in the spring of 1923. (These stations serve as organized centres where the results of the experiments are demonstrated in a practical way).

Rotation of Crops

When a farm is selected, the first work undertaken is to divide the land into definite areas in preparation for a systematic rotation of crops. On all the Illustration Stations in Quebec, a four-year rotation is practised. The following plan illustrates this rotation:

FOUR-YEAR ROTATION

——	Field A	Field B	Field C	Field D
First year.....	Hoed crops.. ..	Grain and seeded clover 10 lbs., timothy 10 lbs. per acre.	Clover, 1st cut, hay, 2nd cut, seed.	Hay or pasture.
Second year .. .	Grain and seeded clover 10 lbs., timothy 10 lbs. per acre.	Clover, 1st cut, hay, 2nd cut, seed.	Hay or pasture .. .	Hoed crop.
Third year... ...	Clover, 1st cut, hay; 2nd cut, seed.	Hay or pasture.	Hoed crops..	Grain and seeded clover, 10 lbs., timothy 10 lbs. per acre.
Fourth year.......	Hay or pasture. . .	Hoed crops.. .	Grain and seeded clover, 10 lbs., timothy 10 lbs. per acre.	Clover, 1st cut, hay; 2nd cut, seed.

A great deal of the success in growing crops economically depends on the thoroughness of the cultivation given and the methods employed when cleaning the land for the hoed crop. If this work is not efficiently done, weeds will seriously affect the grain crop in quality and quantity, and will also make it practically impossible to produce pure, clean, red clover seed. Hence in conjunction with these rotations, the practice of after-harvest cultivation is followed in preparing the land for the hoed crops.

After Harvest Cultivation

When preparing sod land for hoed crops, the system followed, and found successful on the Illustration Stations, is to plough shallow as soon as the hay is taken off, turning a flat, shallow furrow. The roller is next used to firm the sod in order to hasten its decomposition and to prevent the sod from being torn up with the later cultivation. Throughout the summer and until late fall, the land is kept frequently stirred with an oval-pointed cultivator, where possible, to keep down weed growth and to bring the couch grass roots, etc., to the surface. Prior to freezing up, the land is again ploughed in the same direction as before, and as deep as the nature of the soil will allow. Averaging the Stations in Quebec for 1921, it was found that it cost $3.91 per ton to produce ensilage corn on land that had been fall ploughed only, and $2.17 on after harvest cultivated land. There are also indirect benefits to succeeding crops, which are unaccounted for here.

Growing Red Clover Seed

When the Illustration Station started in the Aubrey district in 1916, it was found that the farmers were purchasing their red clover seed, which was mostly imported seed. A start in clover seed growing was made on the Station in 1917, and since that time, successful seed crops have been grown from the second crop of red clover, which had previously been pastured. The records kept by one of the farmers who grew clover seed and bought a huller, show that since that time he has threshed 31 tons of seed. The Provincial Government huller, from 1917 to 1919, threshed 17 tons, 414 pounds, and the Farmers' Club huller, since 1917, has threshed 63 tons, 1,835 pounds, making a total of 112 tons, 249 pounds. Valuing this at current prices, this one Illustration Station project has meant an additional revenue of $80,135.15 to the farmers of the Aubrey district. Red clover seed has also been grown with good success on the Illustration Stations at Stanbridge East, St. Julie, St. Clet, Lachute, St. Casimir,

Plessisville, Pierreville, Campbell's Bay, and as far east as New Carlisle on the Gaspe Peninsula.

Tile Drainage Demonstration

To reclaim to more profitable production those lands that are wet and cold, and also the heavy clays that are resistant to tillage through lack of drainage, an effort has been made to demonstrate the usefulness of underdrainage on certain Illustration Stations. When the station was started at Stanbridge East, seven years ago, two four-year rotations were laid out on adjoining portions of the farm. One rotation was partially tile drained, the other was left undrained, but was ploughed into narrow ridges and carefully surface drained.

Records as to yields and cost of production have been kept on both rotations, to determine the gain that would result from drainage. Five years' average results show that the tile drained land has given an increased yield over the undrained land of 2½ tons of corn per acre, 9·3 bushels of oats per acre, 1,440 pounds of clover hay per acre, and 900 pounds of timothy hay per acre.

Turnips and Mangels Introduced

There are many districts in Quebec where hay and grain growing are specialized in, with the result that the land is steadily becoming weedier and yields are falling off. In many of these districts, the belief is that root crops cannot be grown successfully under their soil and climatic conditions.

In connection with these two crops, the work of the Illustration Stations takes on two forms: first the extension of the root growing areas, and secondly the demonstrating of methods that will reduce hand labour, and thereby lower the cost of production of roots. With the idea of introducing and improving the cultural practices relative to these two crops, the growing of either one or both is being illustrated on all the stations in Quebec. The results of a survey made of twenty-four farms in the vicinity of the Illustration Station at St. Jules. Beauce county, will illustrate the increase that has been made in this respect since the establishment of the station at this place:

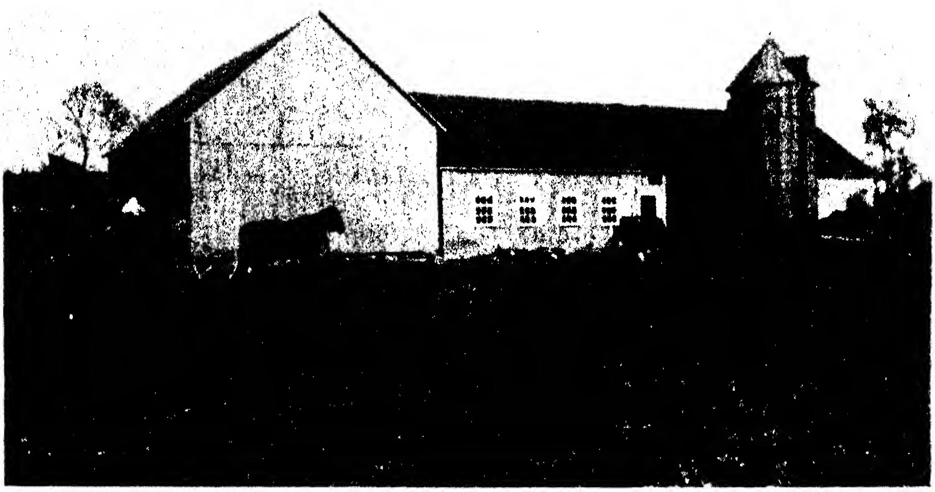
Showing condition of farm buildings when illustration work began

Year	Number of farmers growing turnips	Tons produced
1920	2	10
1921	4	31
1922	24	344

Determining Cost of Production

Unless an accurate record is kept of all the items of expense that enter into the cost of producing crops, it is impossible to check up on costly crops

and defective methods. Too frequently the cost of growing farm crops is underestimated, because the farmer and members of his family do a great deal of the work themselves. On all the Illustration Stations careful records are kept of all items of expense pertaining to the cost of growing each crop on each station. These items include rent of land, use of machine, horse and manual labour, threshing, cost of seed, cost of manure and fertilizers. By so doing it is possible to check up defective methods, and to determine which are the most profitable crops to produce. As all the fields on these Illustration Stations are fronting on the main travelled highway, the method of growing and handling comes under the public eye. In this way passers by become informed as to the possibilities of growing such crops as corn, sunflowers, roots, clover seed, etc., and the proper methods of handling them.



On the same farm, three years later.

Field Meetings

Not only is the work on the stations noted from the public highway, but practical discussions, in the form of field meetings, are held on these stations during the growing months. At these meetings, all the details relative to the different crops—the varieties of grain, the preparation of the soil, the rates of seeding, the methods of handling fertilizers—are discussed. In this way the results of the work done on the Experimental Farms themselves are brought to the attention of the farmers in the different districts, and methods proven sound, safe and profitable relieve those farmers of the anxiety, disappointment and loss which poor farming methods or haphazard individual experiments would otherwise bring.

SALVING A TUBERCULOUS DAIRY HERD

Successful Operation of the "Bang System" at the Central Experimental Farm

ABOUT six years ago, the Central Experimental Farm at Ottawa introduced the Bang System in connection with its dairy herd, which was then undergoing the process of " accreditation." Under this " accredited " system, a herd is tested for tuberculosis every six months, the reacting animals being removed from the herd. When reactors cease to appear under the test, the herd is accredited by certificate as tuberculosis free. Under the Bang System such reactors as are considered sufficiently valuable are segregated and isolated from all contact with other animals, their progeny being added to the main herd. The length of time during which the reactors are retained depends on their age, period of gestation, producing ability, and the progress of the disease; but gradually they are eliminated, and in the course of time the Bang herd ceases to exist.

The object in establishing a Bang herd at the Central Experimental Farm was twofold: first, to preserve for breeding purposes a number of exceptionally valuable cows, and second, to demonstrate the value of the Bang System. The segregated animals were isolated in comfortable, well ventilated and properly appointed premises on an adjoining farm some two miles distant from the Central Farm. The cattle were in charge of a skilful herdsman, and were treated in a normal manner in all respects. The maximum number of animals in the Bang herd at any one time was 23 head, while the total number isolated during the whole period was 66 head, and included Holsteins, Ayrshires and Jerseys. All of the cows were of high individual merit and record. Some of them remained in the Bang herd throughout the whole period, others were retained for a short time only.

During the winter the segregated animals were kept inside, but in the summer they were allowed on pasture. The milk was thoroughly pasteurized and separated, the skim-milk being used for feeding hogs and the cream being made into butter. The cows were for the most part bred to reacting sires. When a reacting sire was not available they were bred to another on neutral ground. The calves were removed soon after birth and placed in isolated pens until tested before being allowed to mix with the calves from the healthy herd on the main farm. Of the sixty-six head isolated, 49 gave birth to 80 calves. Of this number 18 died previous to six months of age; 17 at the age of six months or over reacted to the tuberculin test, some of which infection undoubtedly occurred in the main herd, it not yet having been cleaned up; 45 remaining free from the disease. Of the latter, 19 have been sold and 26 retained in the breeding herd.

During the period under review, 51 Bang cows were slaughtered. The majority of these were removed to make room for other and more valuable reactors and comparatively few on account of clinical symptoms of advanced tuberculosis. In the latter class there were not more than six cases. On the other hand, there were a number of cows that had outlived their usefulness but were still in excellent condition, which, upon slaughter and examination, proved to be highly generalized and advanced cases. This goes to prove what has been repeatedly observed, namely, that a cow may be in an advanced

stage of tuberculosis and still not show any outward symptoms of the disease. Furthermore, the experience with this herd has shown that a cow may be in an advanced stage of tuberculosis and still produce milk quite heavily and profitably. Another outstanding observation as regards the health of the herd was that quite a large percentage of the cows when slaughtered showed only old calcified lesions, while a few showed two distinct sets of lesions, one old and calcified and the other recent and open This would go to show that in many cases, nature, assisted by a rugged constitution in the animal, had isolated the infection and thus put the animal in the non-spreader class. The presence of a secondary set of open lesions in some animals points to reinfection through being stabled with spreader cases.

Some cows that were in the Bang herd for two, three, and even four years, when slaughtered, proved to be but slightly infected, indicating that an animal may be some time developing the disease even when amongst diseased animals and, when eventually infected, may show considerable resistance to the ravages of the disease. On the other hand, among cows in the main herd that reacted and were slaughtered immediately, numerous generalized open cases were found, which goes to show that infection may take place rapidly and run a rapid course. It may be inferred that the rapidity of infection depends on the virulence of the strain of bacteria introduced and on the power of resistance in the animal itself.

Milk and butter-fat records were kept of the Bang herd during the entire period. Eight of the cows qualified in the Record of Merit test and 13 in the test for the Record of Performance. Of the latter, eight records from mature cows averaged 461 pounds of butter fat, nearly all being made in less than 365 days. One Ayrshire cow, Marjorie 8th of Ottawa, during the four years that she was in quarantine, gave 32,987 pounds of milk containing 1,214.74 pounds of fat. This animal when slaughtered proved to be badly infected in the lungs and bronchials. These and other creditable records would indicate that tuberculosis, up to a certain stage, does not necessarily reduce the milk production of some cows; in fact, the production of the Bang herd varied but little from that of the main herd.

An accurate account was kept by the Experimental Farms Branch of the expense incurred in operating the Bang system from December 1, 1916, to November 1, 1921. The receipts for milk, calves and manure amounted to $22,108.06. The expenses, which included feed, bedding, rent of building and labour, amounted to $15,930.63, leaving a profit of $6,177.43.

Conclusions

In the light of the experience of the Central Experimental Farm, it is concluded that the Bang system is both feasible and practicable where circumstances warrant its operation. According to the views of the Experimental Farm officials, these circumstances would be (1) The existence of a herd or herds of pure-bred cattle of sufficient size and high quality to make the isolation of reactors and the reclaiming of their progeny profitable; (2) A sufficient number of reactors of high quality within the herd to ensure returns on the overhead charges that must be met in maintaining a Bang herd, which overhead charges might be so great as to exceed the returns from only a few reactors.

In view of the rapid adoption of the Accredited Herd System, now taking place, and particularly since the reduction of the compensation on reacting animals, there are undoubtedly many herds that might adopt the

Bang system and at the same time fulfil the Accredited Herd conditions. In some cases, where the individual herds are not sufficiently large or the reactors within the herd not so numerous as to warrant the introduction of the Bang system, a group of breeders might unite in maintaining a joint herd under the Bang system.

A conclusion which should not escape attention is that if a Bang herd is to justify its existence at all, *it must be established simultaneously with the entry of a herd into the Accredited Herd System,* for the reason that it is at this time that the greatest number and often the highest quality reactors will be found. As each successive test proceeds, the number of reactors naturally decreases, so that, in the course of a few years at most, the herd should have a clean sheet and the Bang herd would be gradually eliminated. It is when the herd has this clean bill of health that the owner who has omitted to establish a Bang herd may wish that he had done so and thus have retained some of his favourite individuals and strains.

MOSQUITO CONTROL AT BANFF, ALBERTA

By **ERIC HEARLE**, Assistant Entomologist, Entomological Branch

In the *Agricultural Gazette* for May-June, 1922, the writer contributed a brief statement on an aerial survey of mosquito breeding places, conducted in the Lower Fraser Valley of British Columbia, which survey was made in 1921. In the same year, in company with Mr. Arthur Gibson, Dominion Entomologist, a brief survey was made of mosquito infested areas in the Rocky Mountains National Park, adjacent to the town of Banff and the station of Lake Louise, Alberta.

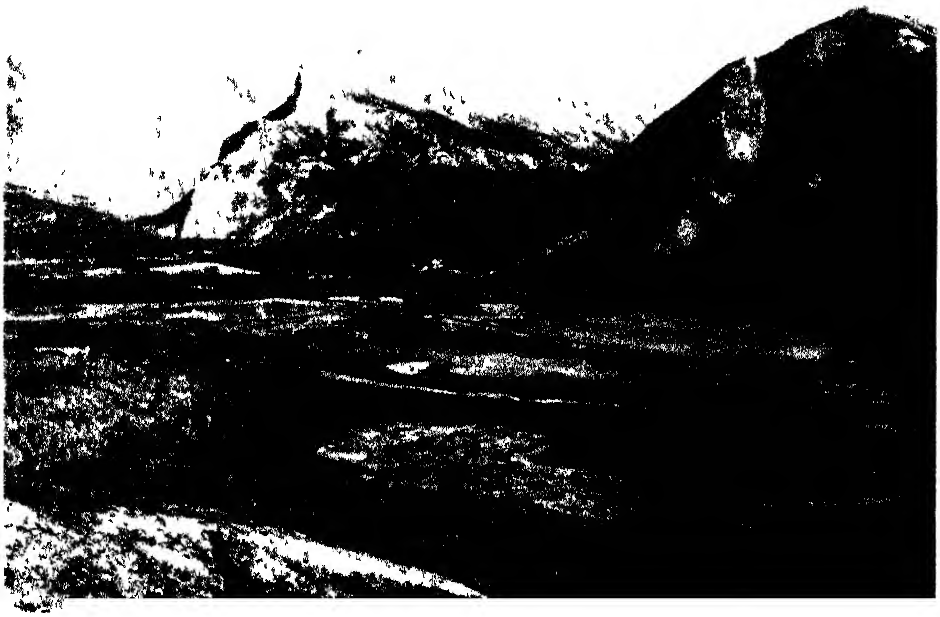
It had been recognized for some time that relief from the mosquito trouble might be possible, and in the summer of 1916, the late Dr. Hewitt undertook a preliminary survey and drew up valuable recommendations. During the last three or four years a certain amount of control work has been conducted under Messrs. Sanson and Childe of the Dominion Parks Branch, and considerable success was met with in the reduction of the mosquitoes. In the spring of 1922, Mr. Arthur Gibson, the Dominion Entomologist, arranged for a detailed investigation into the pest and the writer was given charge of all the investigational and control work. Oiling operations were extended much further than previously and, as a result, the mosquito pest in the vicinity of Banff was reduced to a negligible quantity during the past season.

The 1922 investigations showed that of a mosquito fauna of some 18 species only three of these were important pests.

There were found to be two main problems—the snow pool problem in the early summer and the flood water problem dependent upon the river freshets. In the former, one species of mosquito only is important, namely, *Aedes cataphylla Dyar;* but in the latter, while *Aedes cataphylla Dyar* is the species of main importance, *Aedes intrudens Dyar* and *Aedes vexans Meigen* have also to be reckoned with. In May, the melting snows fill depressions with water and larvæ of *Aedes cataphylla* are to be found in these pools in great numbers. The majority of these emerge during the last week of May and constitute the snow pool pest.

The time of the river freshet varies. In 1922 it occurred in the first week of June. Mosquito larvæ were found in vast numbers in the flooded areas and most of those that escaped the application of oil completed development before the end of the month. Collections of larvæ made throughout the district showed that the low-lying area to the west and north of the town is mainly responsible for the pest. In some parts of this basin fairly extensive meadows occur, but dense willow growth clothes the remainder. The breeding areas appear to be of importance to a distance of about four miles west of the town.

During the past season, oiling was mainly resorted to in dealing with the pest. Four men were employed throughout May and June to apply oil, and occasional extra help was provided as needed. Oiling occupied some 194 days labour and about 2,800 gallons of oil were applied. Watering cans and knapsack sprayers were utilized in spreading the oil. The whole breeding area was divided into three districts, one man being held responsible for the work in each. Large drums of oil were distributed by truck to various points in each district, and from these points the oil was transported in smaller containers to a number of stations in the breeding areas. A pack pony and a canvas boat were found useful in this connection. Oil was spread on all water where larvae were found, and whenever oiling was completed in any one section, patrols were made to ascertain if effective killing had been secured. Coal oil was used alone as, owing to the cold nights, it was thought inadvisable to use heavier oils.



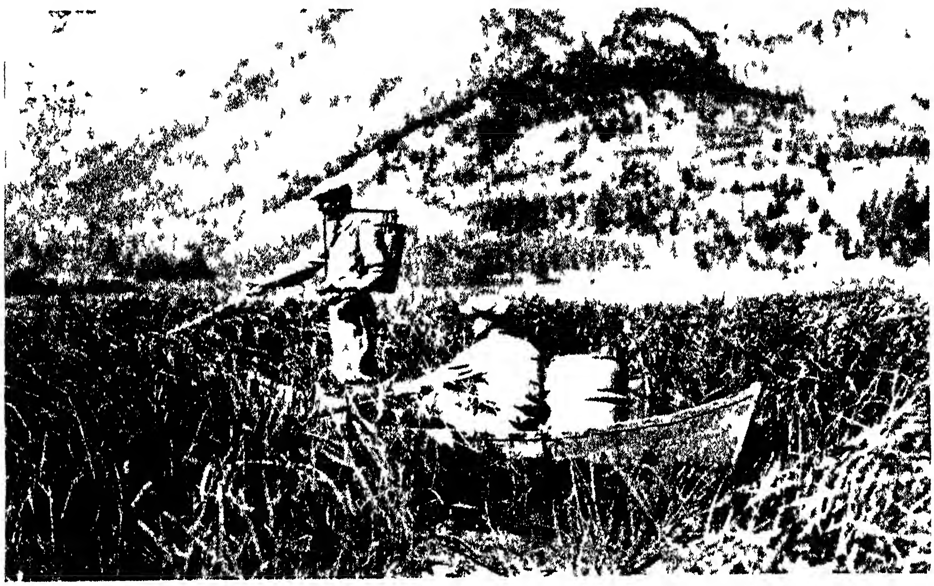
Mosquito Breeding Area near Banff.—Flooding of such areas causes ideal conditions for mosquito development.

A number of the breeding pools were undoubtedly missed owing to the difficult nature of the territory involved; and in some of the more

open stretches wind rendered the oil film partially ineffective In spite of this, however, the results of oiling were very marked, and about 75 per cent control was realized The town of Banff and the immediate vicinity were rendered comparatively free of mosquitoes.

After the necessity for oiling was over, the mosquito squad worked on permanent improvements A number of ditches were dug to divert small streams feeding various swampy areas In many parts of the district the willow growth was found to be so dense that penetration was extremely difficult and the work of oiling was greatly retarded To mitigate this a large number of trails were cut through these areas and the majority were rendered easily accessible

During the season of 1923, the Entomological Branch plans to continue investigations into the mosquito situation at Banff Flight experiments will be conducted to ascertain the actual distance from which infestation is possible, and it is hoped to secure data regarding the possibility of introducing certain natural control elements such as the minnows, which would materially reduce the cost of oiling operations Experiments have also been projected to test out the comparative values of oils, larvicides etc, and their adaptability to the needs of the district



Oiling from boat at edge of Vermilion Lakes

MYCOLOGICAL PROBLEMS IN MANUFACTURE AND CONSTRUCTION

By H. T. GÜSSOW, Dominion Botanist

FROM time to time we are consulted in matters pertaining to mycology or fungi generally which do not strictly relate to these plants as causal agents of plant diseases. Yet in other respects they are of considerable interest and a resumé is herewith given recording some of the more interesting matters that have been brought to our attention. Fungi, especially the microscopic forms, play such an important role in the economy of nature that those forms appearing associated with industries of mankind are only very occasionally referred to

Every housewife is familiar with the annoying and persistent spots that result from allowing fabrics of any kind to remain damp. Popularly such spots are referred to as mildew or mould spots. When they appear, whether in linen, cotten, silk, wool, or leather, they are most disfiguring and a source of much disappointment. These spots may vary considerably in size and colour. Sometimes they appear in large numbers not larger than a pinhead; sometimes they are of considerable size. From grayish, yellowish, greenish, they may also appear with brick red edges, or appear almost black. All these spots are very different from ordinary stains, or rust spots. They penetrate the tissue, and materials left too long in a damp condition may be hopelessly spoiled. On studying these spots in a mycological laboratory it is quickly recognized that they are caused by quite a number of minute fungi, but there cannot be any doubt that bacteria and yeasts also, are responsible for the production of such spots. The different colours are no doubt due to specific organisms. Among these may be mentioned the common green and blue moulds (*Penicillium*), several of the bread moulds (*Mucor*), and species of a fungus known as a most remarkable colour-producer, viz: *Fusarium*. We have also observed various coloured yeasts and cocci. Most of these fungi are starch-loving, and no doubt they feed upon the materials used for sizing. Glues, starch, and doubtless, substances used as mordants in coloured fabrics, supplied with the necessary moisture, will form quite congenial media for the growth of these organisms. The removal of these spots is very difficult; the sooner they are observed the more likely are the results to be successful. Sometimes ordinary laundering will reduce the intensity of the spots—heat from a sadiron and the promiscuous use of chemicals will often permanently fix the spots. Bleaching in the sun will often remove spots. Lemon juice, sour milk, lactic acid, Javelle water and permanganate of potash solutions will be often found useful. Any brown stain resulting from the permanganate may be removed by an application of peroxide of hydrogen. In coloured materials care must be taken to test the effect of any solution used on some piece of the same material less open to view.

Serious trouble is sometimes experienced in goods imported via ocean routes, dampness and wet affecting the tightly baled goods, whilst lack of ventilation, together with the practice of re-directing shipments before unpacking same, have led to many claims for damages. In such cases ordinary care in handling, and the provision of really dry situations in ship holds will do much towards enabling materials to escape serious injury.

The use of badly prepared paste often leads to very unsightly spots

on wallpapers. These are very difficult to remove, especially where there are damp walls. If kept absolutely dry, no spots are likely to result.

In examining recently some very special papers used in the manufacture of bank notes, our attention was called to the large number of mould spots appearing after the paper was kept moist for the purpose of printing engravings. The fungi responsible in this case were a *Penicillium* and *Stachybotrys*. Their appearance had to be prevented, since the paper was very valuable. It was found that passing the paper through formalin solution permitted the completion of the printing process without any further trouble. When such spots appear in finished copper or steel engravings that are of some age and value, our experience has been that it is best to make no attempt to remove them—generally the result from the attempt was worse than the original damage. These papers are generally laid papers and very spongy and do not stand even careful submerging in water.

Other cases that have come to our notice related to mould development in unmanufactured (raw) sheet rubber. Bearing in mind that rubber is the latex of certain plants, one can readily realize that this substance will form a medium for the growth of quite a number of fungi. The spots produced by the fungi were of quite different texture from the sound rubber. The affected portions had lost their elasticity and often were somewhat "doughy." Several bright yellow *Penicillium* species, one *Mucor*, and three *Fusarium* species were isolated. Probably infection had already taken place in the country of origin, and in the barrels or boxes in a ship's hold matters were not improved. Frequent sponging with formalin solution will prevent the appearance of such spots; and cool, well ventilated storage conditions should be the first safeguards provided. Sometimes the damage is very considerable, and rubber so infected cannot be used for the manufacture of high class articles, such as inner tubes, etc., where elasticity is the principal requirement. Leather goods also are often liable to become mouldy; but, in general, such a condition is due to neglect in keeping such goods in reasonable condition.

Our plates 1-4 show the result of the growth of a higher type of fungus, one of the most serious offenders in wooden buildings, barracks, warehouses, etc., etc., including the very diverse materials that may be contained or stored in such places. The fungus in question is popularly known as "dry rot fungus," a term which in its flexible use, may include a number of forms or groups of forms. In this particular case, the causal agent proved to be the true dry rot fungus, *Merulius lacrymans*. Among several cases brought to our attention one within the last year deserves special mention. Samples of wood forming a wooden structure, together with some of the materials stored therein, were received and carefully examined. There was present abundant fruiting material from which the fungus could be identified.

The fruiting bodies of this fungus vary considerably in size and shape, depending largely upon the undisturbed and favourable conditions under which they are produced. In the early stages one may discover a white, cottony, more or less dense growth of fungus spawn spreading over the surface of any kind of structural wood. Thus flooring, window sills, joists, beams, posts, etc., may exhibit these symptoms. If left undisturbed, these white cottony patches increase in size and may become confluent. At a later stage the patches assume in

Plate. 1. Portion of 2" plank showing typical "dry rot" produced by *Merulius lacrymans*, the dry rot fungus. The characteristic mycelial strands of the fungus are still visible. When rubbing decayed wood between finger and thumb a fine powder is the result—as shown on the small piece of cardboard.
Photo H. T. Güssow.

their centres, yellow, orange to reddish brown tints, becoming darker and darker with age, until sometimes the centre may be a deep chestnut brown. The edges, however, always remain cottony white, as long as the fungus is alive. These colour changes indicate the progressive stages of maturity. While they are proceeding, organization of the fruiting layer takes place, which first manifests itself by curious raised, wormlike folds, commencing in the centre and becoming more and more prominent as the intensity of colour increases. Eventually there is formed over these folds a gelatinous, smooth covering, in which the reproductive organs develop (hymenium). One very prominent feature, more particularly under moist atmospheric conditions, is the development of beads or drops of water on the surface of the active growth zones of the fungus patches. Hence the specific name lacrymans from the Latin lacrima or lacruma, a tear, in its verbal participial form, "weeping." The fruiting layer (hymenium) consists, as in other fungi, of groups of a large number of club-shaped organs which carry four golden yellow spores. These spores are the reproductive organs, and being exceedingly minute, may be dislodged from their supports by very light air currents. In this manner they fill the air of infected buildings, settling slowly and starting new infections as they fall upon suitable materials. The principal condition for life of these fungi is moisture. In absolutely dry buildings dry rot fungi cannot exist. The name dry rot fungus is not very fortunate, since moisture is essential to its growth; and only in the peculiar dry powdery nature of the destroyed wood has the epithet its justification.

The effect of the growth of the fungus on wood is very destructive. It may be said that apparently no kind of wood is absolutely resistant. All our commonly used kinds of lumber for building purposes are easily affected—though apparently, cedar is able to resist longest. Long before external signs of the fungus becomes noticeable, affected wood appears abundantly permeated by the spawn or hyphæ of the fungus. These hyphæ possess the property of forming long dense strands which act as conductors of water. It is remarkable to observe how the fungus may conduct water from a considerable distance, and thus furnish one of the most essential elements for its growth. The infected wood assumes a peculiar golden brown colour, which, no doubt, is the result of a chemical metabolism due to the fungus. The wood loses enormously in substance, the shrinkage amounting to some 60 per cent of its original volume. It becomes extraordinarily light in weight when the fungus has completed its destructive work. This loss of substance is accompanied by the very characteristic production of deep and severe cracks or tearings—see fig. 1. When in this condition, the affected portions of wood absorb and retain water like a sponge, and, for a time no doubt, act as reservoir to supply the requirements of the growing fungus. When dry, the wood may be so brittle as to be readily reduced to a fine dust or powder by rubbing portions between the finger and thumb.

Naturally so severe an attack on the rigidity of wood, reduces its supporting value and frequently floors, ceilings, partitions, etc., will suddenly collapse. Indeed the destructive work of the fungus, unless its presence is known in time, may render occupation of infected buildings postively dangerous to their inhabitants. There is one feature worthy of notice. Buildings affected

with dry rot generally indicate its presence by a pronounced fungous or musty odour, which, indeed, is often the cause of complaint and which, on investigation, will reveal the fungus in many cases.

The fungus may spread with considerable rapidity, and, before its ravages have become known, very considerable damage may result to any or all of the contents of such attacked structures. Wall papers, and from these, pictures on the walls, overmantels, carpets, books, and even furniture situated close to an infected wall may become infected. corrosion of the cartridge casings to such an extent as to render the use of the ammunition decidedly unsafe. No doubt the physiological action of the fungus, or else the oxidizing effect of the moisture present, was responsible for the damage to these cartridge cases. That the physiological action of the fungus is most pronounced is, of course, seen in the wood, but our fig. 3 forms a most interesting example of such action The garment figured was taken from certain stores, and was originally of a bright blue colour. These garments were piled on wooden shelves

Plate 2. Small arms ammunition rendered unserviceable through the action of dry rot fungus The brass casings are severely corroded, mycelial remnants still adhering thereto. Photo H T. Güssow,

The fungus material will quickly permeate the wood of boxes, cover and involve the entire contents of the same, appear on the outside, produce its spores, and, if undisturbed, quickly infest an entire room set aside for storage purposes. We are able to show some of the effects of the fungus on materials not generally regarded as suitable media. In the case of fig. 2 representing a quantity of small arms ammunition taken from magazine shelters, it will be noticed that the fungus caused a infected by the dry rot fungus, which eventually spread into the garments and produced a most brilliant display of colours, such as cannot be reproduced to any striking extent by an ordinary photograph The colours ranged from a crimson to a bright pink and from yellow to all tints of green, leaving towards the outer edges fan shaped white masses of the fungus hyphæ. The garments were completely spoiled by their display of colour, as well as by having become thoroughly decayed.

In conclusion, a few words may be said as to the origin of infections, from which may be gathered instructive hints as to the prevention of the same.

As has been said before, dry rot will never appear in buildings that are quite dry. Lack of ventilation, the use of wet lumber, the use of damp saw dust between partitions, indeed anything introduced into construction not thoroughly dry, are the principal causes of an outbreak.

Once a building is severely affected, no repairs will for any length of time save the structure. The spores of the fungus previously present will start into active life, unless adequate provision is made as regards ventilation and artificial heating. If observed in time before any fructification has occurred, it might be possible to remove infected wood and replace same by sound. But the difficulty in saving a building once infected is very great. When repairs have been resorted to, it is obvious that all infected material must be removed and it would seem advisable to thoroughly disinfect the entire room, or structure, as the case may be, by the use of formalin washes or sprays, followed by a very thorough and prolonged period of ventilation or artificial heating.

If the damage is severe, the most economical way is to destroy the structure by fire, where possible, and not to erect another on the same situation, unless care is taken that all infected material is disposed of. We have often observed the use of very wet rough lumber for flooring over joists before the top finishing layer was placed in position. With any fungus spores present, and with the prospect of a damp spring and lack of fires, such a practice is to be condemned, and often enough serious damages from dry rot may be traced to such careless use of wet lumber. The use of old lumber previously used in other structures may be tempting because of low initial cost, but should be avoided unless its former use is known. In wood yards considerable damage has been observed to new lumber piled on decaying, dry-rotted supports. Naturally, slightly infected lumber will es-

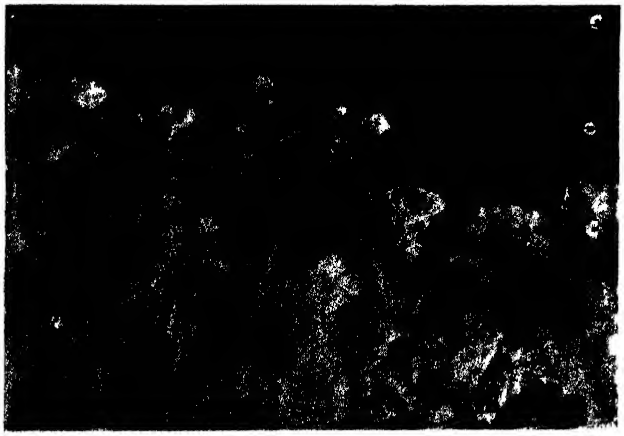


Plate 3. Effect of the vegetative mycelium of *Merulius lacrymans* on a garment. Originally bright blue in colour, the action of the fungus produced a remarkable colour effect varying from purple to pink, and yellow to green. One of the buttons made of vegetable ivory palm seed also showed signs of deep corrosion.
Photo H. T. Güssow.

cape the notice of the purchaser, and thus introduce the germ of a very costly and destructive agent.

One reason why the losses from dry rot in Canada are not so severe as in European countries is that the climatic conditions are less favourable to its development, but more particularly, we owe our relative immunity to the thorough drying our houses receive during a long winter's heating.

We are aware of the recommendations made relative to the use of creosoted lumber, which, no doubt, is most suitable for some purposes, but quite out of place in dwelling houses, hospitals, cheese factories, or breweries, where the odour will quickly become offensive and objectionable to the inhabitants, or injurious to manufactured substances likely to absorb the odours of creosote.

Besides *Merulius lacrymans*, one of the most destructive of dry rot fungi, there may be mentioned *Poria vaporaria* (Pers.) Fries, which may be referred to as pore-bearing dry rot fungus, since the very prominent pores which the fruiting layer forms, are a diagnostic feature. This fungus is nearly as destructive to wooden buildings as *Merulius,* and, since it is not uncommonly found on living trees in the woods, great care is necessary in examining the lumber used for building. The diseased wood becomes deeper in colour than that attacked by *Merulius,* and often assumes a red brown tint. It also is equally brittle. The fruiting bodies of *Poria* (see fig. 4) consist of a very thin layer of fungous material, in which the numerous irregular and very shallow pores are formed. Buildings attacked by this fungus may with care be repaired, and, if the wood is kept very dry, and painted with good oil paints, one may avert serious damage.

The Division will always appreciate having their attention directed toward any interferences of a like nature with any phase of manufacture or industry. The results from

Plate 4 Fruiting layer of another type of dry rot caused by *Poria vaporaria*
Photo H T Gussow

investigation into these matters will readily be placed at the disposal of inquirers, besides assisting us in accumulating valuable knowledge and materials relating to destruction brought about by fungi.

CANADIAN GOVERNMENT STANDARDS FOR CANNED FRUITS AND VEGETABLES

By C. S. McGILLIVRAY, Chief Canning Inspector

TWO enactments are in force in the Dominion of Canada relating to canned and evaporated fruits and vegetables. They are The Food and Drugs Act and The Meat and Canned Foods Act. They are administered respectively by the Department of Health and the Department of Agriculture.

The Food and Drugs Act deals with the purity, wholesomeness and weight of all food products, and is effective everywhere in Canada.

The Meat and Canned Foods Act deals with the sanitary conditions of the plant in which the food is manufactured, the soundness of the raw material from which it is prepared, and requires that the container bear upon its label a true and correct description of the product.

This Act and the Regulations made thereunder applies in all plants doing an export or interprovincial trade where fruits and vegetables and fruit and vegetable products are canned, evaporated, dried or otherwise prepared for food, or where milk is canned, evaporated, dried or otherwise preserved. It also applies to places where such products are stored for interprovincial or for export trade.

Sanitation

An establishment manufacturing either of the aforementioned products for export or for interprovincial trade must first obtain a permit to operate from the Minister of Agriculture.

Before granting such permit the Minister must be satisfied that the premises in which the manufacturing operations are to be conducted are in all respects sanitary as to construction, equipment and appliances. The number of the permit when granted must appear on all boxes, cases, etc., used at the establishment. All employees handling food products in an authorized establishment must be free from tuberculosis or other communicable disease and must observe such sanitary regulations as the Department may require.

To see that these and other requirements are met, such establishments are inspected from time to time by the Department's inspectors.

The Act requires that all fruit, vegetables, milk, or other articles intended for use in an authorized establishment shall be sound, wholesome and in every way fit for food. Should any article of food be found, either in the course of preparation or after it has been prepared, to be decomposed, diseased, or otherwise unfit for food, it shall be confiscated by the inspector and destroyed under his supervision.

Description of the Product

The containers in which fruits, vegetables, milk or other articles prepared for food in any authorized establishment are placed shall be marked, unless otherwise ordered by the Governor in Council, (1) With the name and address of the packer, or, in the case of a firm or corporation, with the firm or corporate name and address of the packer, or of the first dealer obtaining it direct from the packer who sells or offers the same for sale. (Such dealer shall, upon the request of an inspector appointed under the Act, disclose the name of the packer of such article); (2) With a true and correct description of the contents of the container. This description is defined by regulation and is regarded as the standard of quality.

Standards of Quality

Four standards of quality have been legalized and clearly defined, namely, "Fancy Quality," "Choice Quality," "Standard Quality," and "Second Quality."

In addition to general standards for vegetables, specific grades have been established for canned peas. These are as follows: Size No. 1, Size No. 2, Size No. 3, and Size No. 4. The size is determined by the opening in the sieve through which the green peas will pass.

Canned fruits are graded for quality and syrup. In grading for syrup the terms of "Heavy Syrup," "Light Syrup," and "Without Sugar" are employed. The degree of syrup which constitutes these grades is defined. If the packer so desires, he may substitute for the words "Heavy Syrup," "Light Syrup," and "Without Sugar" the words "Packed in Syrup.....% Sugar," (stating the percentage of sugar in the syrup).

The terms denoting quality and grade must appear upon the main portion of the label in plain type of a size not less than $\frac{3}{8}$ of an inch in height. Thus, in the case of peas, the label must indicate the quality and size of the peas contained in the can. In the case of fruit, it must indicate the quality of the article as well as the consistency of the syrup so far as sugar content is concerned.

The declaration of net weight on certain sizes of containers is not required, as these sizes have been standardized. These sizes are known as Size 1's $1\frac{1}{2}$'s, 2's, $2\frac{1}{2}$'s, 3's and 10's. The minimum net weight of both liquid and solids as packed is defined for each of these sizes. Sizes not standardized must show on the label the net weight and the drained weight.

The administration of the regulations as to Standards is directed from Ottawa through a staff of trained inspectors. The goods are examined at the cannery and check samples are sent in for confirmation. If the goods are found to be incorrectly labelled, they are held for regrading or re-labelling. If goods found in a wholesale or retail establishment are not truly labelled as to grade, they are held until properly graded. The packer is always given every opportunity to show that his grading is correct, but if it is found to be incorrect, he must relabel the goods in such a way as to indicate the correct grade.

Export Shipments

The Act stipulates that no shipment of canned or evaporated fruits or vegetables or fruit or vegetable products may be made out of Canada without an export certificate first being obtained. This certificate is issued upon the written declaration of the shipper that the goods are marked as regards grade and quality in conformity with the Act. At the time of issuing such certificate, check samples are taken for examination and grading, and a report on the grading is sent to the shipper.

Import Regulations

No shipment of canned or evaporated fruits or vegetables is allowed to enter Canada unless it is accompanied by a certificate declaring that the product complies with the Canadian requirements. If a shipment arrives without this declaration, it is held at the Customs till arrival of proper documents. As soon as practicable after arrival, the goods are examined for marking and a check sample is taken for grading. If the goods are unproperly marked they are held for proper marking; if improperly graded, they are held for proper marking for grade; otherwise they are returned to the country of origin.

THE SUSCEPTIBILITY OF GRAPE LEAF HOPPER EGGS TO NICOTINE

By W. A. ROSS and W. ROBINSON, Dominion Entomological Laboratory, Vineland Station, Ont.

LAST year two Concord graperies at Vineland, Ontario, badly infested with leaf hoppers *Erythroneura comes,* were thoroughly sprayed with nicotine sulphate 1-1600, in combination with Bordeaux mixture in one case, and with lime in the other, on July 3 and 4. At that time the majority of the nymphs were in the first and second instars, and the most advanced nymphs were on the point of changing from the fourth to the fifth instar. The spray destroyed practically all the immature hoppers, and much to our surprise, it also apparently destroyed most of the eggs, because, although eggs continued to hatch out in large numbers on adjoining vines, only an insignificant number hatched in the two early sprayed graperies. In order to secure confirmatory data regarding the ovicidal value of nicotine sulphate, we sprayed Concord leaves on July 8 with nicotine sulphate (1) 1-1600, (2) 1-1200, (3) 1-800, and marked some other leaves as "checks" In each experiment lime was added to the nicotine sulphate. On the leaves sprayed with 1-1600; no eggs hatched for 11 days, and after that only 4·4 eggs per leaf hatched. On the leaves sprayed with 1-1200 and 1-800, 3·2 and 1·8 eggs per leaf hatched respectively, but no nymphs appeared until 12 days after the application. On the "check" leaves 88·2 eggs per leaf hatched. The evidence, derived from these tests and from the two early sprayed graperies that nicotine sulphate destroys the eggs, appeared to us to be pretty conclusive; however, with a view of securing more precise information, series of spraying and dusting tests were conducted in the laboratory this past winter with definite numbers of eggs and with eggs of known age.

On account of the fact that *Erythroneura comes ziczac* was present in large numbers in the immediate vicinity of the laboratory, this variety was used in all the experiments. The hoppers were placed on one-year-old Clinton vines, and were confined by means of celluloid cages. As the Clinton variety has little pubescence on the underside of the leaves, no difficulty was experienced in locating and counting the eggs. The sprays were applied with a hand sprayer, and the nicotine dust with a hand blower. The results obtained from the tests are presented herewith in tabular form:—

NICOTINE SULPHATE 1-1600, HYDRATED LIME 5 LBS.-40 GALS.

No. of Exposures	No. of Eggs	Age of Eggs when Treated	Per cent Killed in Egg Stage	Per cent Nymphs which Died While Hatching*	Per cent Total Mortality
		Days			
9.	511	1- 2	29·7	48·9	78·6
4.	533	4	61·9	36·[illegible]	98·3
9.	480	9–10	68·5	1·5	100
5.	558	18-19	84·4	15·6	100
27.......	2082				

NICOTINE SULPHATE 1-1200, HYDRATED LIME 5 LBS.-40 GALS.					
6	568	Days 1- 2	47·2	52·8	100
5	513	9-10	57·3	42·7	100
2	538	18-19	67·6	32·4	100
13	1619				
NICOTINE SULPHATE 1-800, HYDRATED LIME 5 LBS.-40 GALS.					
2	477	Days 1- 2	63·5	36·5	100
3	519	9-10	71·8	28·2	100
2	491	18-19	78·4	21·6	100
7	1487				
†NICOTINE DUST—2 2% NICOTINE					
3	482	Days 1- 2	8·8	20·1	28·9
3	508	8- 9	20·2	33·0	53·2
4	528	18 19	26·9	46·7	* 73·6
10	1518				
CHECKS					
8	602	. .	5·7	6·3	12·0

*Nymphs succumbed in process of hatching. None of them actually emerged from the eggs.
†Niagara D.-11.

Heretofore we have recommended that the leaf hopper spray should not be applied until practically all the eggs have hatched, but now we know that this is unnecessarily late, and that it permits too many of the nymphs to transform to the adult stage. The above experiments have demonstrated clearly that nicotine sulphate 1-1200, in combination with lime, will destroy the eggs in all stages of development, and that this strength of nicotine is 100 per cent effective. It therefore follows that spraying should commence about the time the overwintering adults cease egg laying. With our present knowledge, we are of the opinion that the hopper spray should not be applied later than when the most advanced nymphs have just changed to the fifth instar. In cases where it takes a week or longer to spray the vines, spraying operations might well be started when the earliest nymphs are in the fourth instar. Thorough spraying at the time we now advocate should practically eliminate the second brood.

PART II

Provincial Departments of Agriculture

LEGUME PRODUCTION IN MANITOBA

By T. J. HARRISON, Professor of Field Husbandry, Manitoba Agricultural College

THE prosperity of the province of Manitoba depends primarily upon the economical production of grain crops. It has been estimated that about 65 per cent of the annual wealth of the province is derived from the sale of wheat, oats, barley, etc. The chief type of farming, therefore, is straight grain growing, the most common rotation in use being: first year, summerfallow; second year, grain; third year, grain; fourth year, grain.

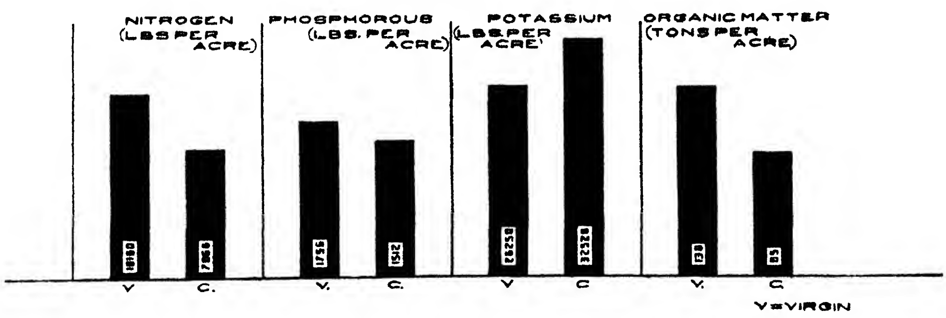
The result of this system of farming is that the farms are becoming infested with weeds, insects and plant diseases. In addition the soil has become less fertile because of loss of organic matter and nitrogen.

The above factors have been responsible for a decrease in yields and also grades. If grain productions is to be kept profitable the yield and quality must be maintained or increased. The only method by which this can be done is the introduction of forage crops into the rotation. Care must be exercised in the selection of these crops in order that they may not only improve the cropping conditions but can be easily marketed. Since they must be marketed through the live stock, only those that can be fed profitably should be grown. One of the most valuable classes of crops from the standpoint of soil improvement and the same time production of good feed is the perennial and biennial legumes.

In this province in the past legumes have occupied less than two per cent of the cultivated land; in the

ORGANIC MATTER AND PLANT FOOD ELEMENTS IN ACRE SURFACE SEVEN INCHES OF SOIL

MANITOBA



Difference in plant food between cultivated and adjoining uncultivated land. More grasses and clover in the rotation will remedy loss of organic matter.

future they will have to occupy up to 20 per cent, if the percentage of nitrogen and organic matter is to be maintained.

Legumes Adapted to Manitoba

There are five perennial and biennial legumes that can be grown in Manitoba, i.e., Alfalfa, Sweet Clover, Red Clover, Alsike Clover and White Dutch Clover.

These crops not only serve to balance the ration for the farm live stock but also provide a means whereby nitrogen can be secured cheaply from the soil air. Alfalfa and sweet clover have deep rooting systems and may thus take the place of a sub-soiler in opening up the lower soil layers. It may be observed as well that such crops leave considerable organic residue in the soil. The latter material is important in that it increases the moisture holding capacity of the soil and in the process of decomposition assists in liberating plant food for the succeeding crop.

With the introduction of these crops, better systems of crop rotations can be organized and the farm income made more regular; moreover, the production of these crops is directly related to a better seasonal distribution of farm labour.

Alfalfa

Alfalfa makes decidedly the best hay and is the legume that will be grown wherever soil and climatic conditions will permit. This will be in the Red River valley, in the Northern Drift area, in the Riding Mountain Wash area and in the Swan River valley, and it is quite possible that after the farmers thoroughly learn the method of production, it will be grown in other parts of the province. There are three essentials in the production of alfalfa:

1st—The selection of northern grown seed of the Grimm variety;
2nd—A fine firm seed bed;
3rd—Inoculation.

Sweet Clover

Sweet clover will thrive in the drier sections and on lighter soils than the other legumes. It does not make as good a quality of hay as the other legumes but it can be used to better advantage for pasture in that there is less danger from loss from bloating of stock.

There are three types of this crop that can be grown in the province, i.e., the biennial white blossom, biennial yellow blossom and annual white blossom. For pasture purposes the rank growing white blossom gives best results; for hay production the biennial yellow blossom produces a finer quality. The annual white blossom will be used only where provision has not been made the previous year as it requires extra ploughing and soil preparation, since the biennial crops can be sown with a nurse crop the year previous.

Red Clover

Red clover is best adapted to a moist climate and for this reason is not proving an unqualified success in Manitoba. The area where it can be grown successfully is naturally restricted. It thrives around Whitemouth in the northeastern zone. It may also be grown with a limited amount of success in the Inter-lake and the Swan River sections. It is possible, however, that with the production of hardier strains, such as the variety originated by the Field Husbandry Department of the Manitoba Agricultural College, the area may be extended.

Alsike Clover

Alsike clover is indigenous to a cool wet climate, and therefore, cannot be grown in the south and west

part of the province. It will be useful as an ingredient in grass mixtures, however, in the eastern and northwestern parts, particularly in the areas where red clover has been recommended.

White Dutch Clover

White dutch clover is very hardy but the plant is so small that it will never become an economic farm crop. It may be used in pasture mixtures; its main use, however, will be in lawn making.

Mixtures

For many years the main use of legumes except when grown for seed will be in mixtures along with grasses. The mixture will depend upon the crop which can be grown in the district and the purpose for which it is intended, i.e., hay or pasture. In general, however, the following mixtures will be found to give good results:—

In the alfalfa districts,—alfalfa and meadows fescue;

In the sweet clover districts,—sweet clover and brome;

In the red clover and alsike districts,—these clovers and meadow fescue and timothy.

Summary

(1) If grain production is to be continued profitably, legumes will have to be grown to maintain the fertility of the soil.

(2) Five legumes, alfalfa, sweet clover, red clover, alsike, and white dutch clover can be grown.

(3) There are three essentials in the production of all legumes:—

- (*a*) Northern grown seed of hardy strains;
- (*b*) Well prepared seed beds;
- (*c*) Inoculation.

(4) Where alfalfa can be grown, it is the one that is recommended. Where it cannot be grown sweet clover may be substituted. The other three legumes will be grown in limited areas only.

(5) For some time, best results for hay and pasture will be secured by sowing these legumes in mixtures with grasses.

FIELD CROP IMPROVEMENT IN SASKATCHEWAN

I. THE WORK OF THE FIELD CROPS BRANCH OF THE PROVINCIAL DEPARTMENT OF AGRICULTURE

By M. P. TULLIS, Field Crops Commissioner

IMPROVEMENT of field crops as it applies to Saskatchewan, and for that matter generally, is carried out, keeping in mind both producer and consumer. A great deal of thought is now being concentrated on the marketing of wheat for the producer or putting the product in the hands of the consumer with the least waste in transit and at the most satisfactory price obtainable.

If all land in our province would grow 25 to 30 bushels per acre every year, the present market might be satisfactory. Unfortunately risks, including drought, hail, frost, rust, variations in the quality of the soil and variations in the efficiency of farm managers all combine to lower the crop average, reduce profit and so increase the risk of wheat growing. Marquis wheat (introduced by Dr. Saunders of the Central Experimental Farm, Ottawa) being earlier ripening than Red Fife, lessened the danger from rust and frost and spread

over the province in five or six years to the almost entire elimination of all other varieties. But rust and frost still cause loss occasionally, and there is room for other introductions, earlier ripening and more resistant to rust. Dr. W. P. Thompson of the University of Saskatchewan has been crossing a large number of wheats to get rust resistance, but difficulties arise in holding other desirable factors with the resistant types. There never was a more progressive age than at present, and agriculture has benefited from many of the recent scientific discoveries. Great strides have already been made in the breeding and selecting of more profitable varieties of cereals, grasses and vegetables, and valuable strains and varieties are being introduced from time to time.

Improving our field crops not only includes the introduction of more profitable varieties by breeding or selecting (Marquis wheat being an outstanding example), but also the choice of the kind of crop to be grown and the raising and maintaining of the quality and productiveness of the crops being used.

Dr. Angus MacKay of Indian Head found years ago that a limiting factor of production in parts of western Canada is the amount of rainfall. Experiments proved that the summer-fallow is a good reservoir for moisture and a link in the growing of grains. Like Marquis wheat, the introduction of the fallow has meant an increase of millions of bushels in the last decade. Unfortunately, the introduction of the summer-fallow into our system has developed a weakness. Soil drifting has entered the scene. This follows the depletion of soil fibre. When the soil surface is dry and fine, the high winds, so frequent on our prairies, cause clay and sand alike to drift about. Luckily, this is true only of some of our land as yet. It has been found that winter rye planted in the fall, and establishing a good root system before winter, is able to get away to an early and vigorous start in the spring, long before other crops show through the ground. As a temporary expedient this soil cover relieves drifting, but it does not return the fibre needed to permanently solve the problem. Professor Manley Champlin of the College of Agriculture, University of Saskatchewan, a couple of years ago pointed out the advantage of fallow substitutes or intertilled crops as a temporary expediency against drifting and an added source of revenue to the farmer. Corn, sunflowers, oats, barley and even wheat in rows are now being grown in a small way on many farms. Authorities are agreed that corn does not appreciably decrease the yield of wheat the following year. It is too soon to tell just what some of the other crops such as sunflowers will do in this regard, although under some conditions in some years there is no question that sunflowers will reduce the next year's yield as compared with either corn or bare fallow.

Important changes in our agricultural programme in recent years include the introduction in some districts of the province on a fairly large scale of corn, sweet clover and grasses. The first mentioned has a valuable place in our agriculture for its own value as a fodder for stock, and secondarily to prevent drifting. The others are of value as fodder, but not more for this than as a restorative of fibre and plant food to the soil as a permanent means of preventing drifting and making it more productive. While it is expedient in some localities to introduce these crops for the sake of the soil, apart from this feature altogether, the farmer realizes that straight grain growing is a great hazard. Some form of insurance must step in to permit a safer system. Fodder crops go with live stock and dairying and mean diversification of farming. With

these the farmer finds that should one source of revenue fail, another can in some measure, at least, fill the breach. The *cream-can*, the *quarter-of-beef*, the *five-cent-egg-in-January*, the *cellar-of-roots-and-vegetables*, the ***stacks-of-clover-and-brome*,** **are all** beginning to arouse widespread attention. They are by no means replacing the waving field of golden grain that the prairies are so proud of, but they will soon generally be an important supplement.

Nor will any variety of crops, or even any strain of a variety, do for our purposes. Care is being exercised that the most profitable strain of the most suitable variety is found. The Canadian Seed Growers' Association is a Dominion-wide organization having in view the raising of the standard of acceptable varieties of crops. In Saskatchewan the Field Crops Branch of the Department of Agriculture has carried out the field and bin inspection work for a number of years. Inspectors have the opportunity of discussing selection and improvement work with each pure seed grower. Fields are scored for purity and quality, and the grower can observe from these his progress as the years go by.

A catalogue of seed for sale by Saskatchewan farmers, including registered grain chiefly, was issued both last year and this by the Department of Agriculture. Many copies were distributed over the prairies of Canada and the United States. Due to the record of our grain at International shows, there is a strong call from the Dakotas for our seed. This outlet should increase as time goes on, as county agents there are spreading broadcast the need of replacing their seed grain by northern-grown seed, particularly of wheat and oats, on account of deterioration due to diseases prevalent there.

The Field Crops Branch has had charge of the collecting and displaying of the best of our grain and sheaf exhibits at the various International Agricultural Exhibitions, and it is believed that the interest taken in these exhibitions by the grain growers of the province has been of great value, not only to the farmers of Saskatchewan but to the farmers of the West generally. During the past eleven years the championship for wheat has been won nine times by Saskatchewan farmers. Another year the province had second place. In addition to the championships, eighty-four sweepstakes or first prizes were won for exhibits of grains, grasses and vegetables. It has been found that in very many cases there has been a marked improvement in the quality of the grain produced over large districts in the province due to the fact that seed grain was purchased from farmers who had demonstrated the superior quality of their strains at these exhibitions. It is remarkable that the prize winning exhibits have come from various sections of the province from the extreme south to points two hundred and fifty miles north of the international boundary line.

Part of the work of the Field Crops Branch is to maintain the purity of our grains by encouraging in every possible way the destruction of noxious weeds. The noxious weed situation on the prairies is not satisfactory. This is a most difficult problem in any of the great grain growing provinces or states. The active co-operation of the municipal authorities, the Department of Agriculture and the farmers generally is necessary to control the noxious weeds which are a serious handicap to good agriculture.

With field crop improvement, as with any other improvement on the farm, the value of the work accomplished depends upon the farmer himself. There is exceedingly valuable work being done in plant breeding

and selection at our experimental farms and agricultural colleges, but the farmer must take advantage of the experiments carried on for his benefit. In our own province the high standard maintained for such a large proportion of our crop, and the prompt advantage taken of new and superior strains introduced, is sufficient evidence that the western farmer is alive to his own interests and is ready at any time to try any new variety that experts have demonstrated to be of value. The very large increase in the winter rye acreage, Saskatchewan growing nearly half the rye crop of Canada in 1922, shows how quickly the farmer is ready to shift to a new crop when he has been assured of its worth.

Saskatchewan stands without a rival in the production of high quality bread wheats and it would seem safe to predict that it will remain so But fifty years hence fodder crops will be important too. Corn, legumes (such as sweet clover) and grasses (such as brome) will be commonly grown. These are links in diversification of farming practice, in spreading the risk and in maintaining satisfactory soil conditions.

II. CROP IMPROVEMENT WORK OF THE FIELD HUSBANDRY DEPARTMENT, UNIVERSITY OF SASKATCHEWAN

By MANLEY CHAMPLIN, Senior Professor of Field Husbandry

THE work of the Field Husbandry Department of the University of Saskatchewan consists of conducting experimental or research work with reference to problems that concern the Saskatchewan farmer, and following up this work by teaching in the class room and making the results known to the public by means of official bulletins, personal letters and articles for the farm papers, as well as by meeting as many as possible of the Agricultural Societies of the province during the year. A permanent staff of 12 is maintained, and during the summer this staff is increased to about 20.

Research Work

The research work occupies a field of about 160 acres adjacent to the University. This field is divided into blocks which are eight rods in width and 396 feet in length. These blocks are divided for experimental purposes into plots which are a decimal part of an acre in size. The plots for preliminary testing are .01 of an acre; those for standard tests, which are to be carried on for a long period of years, are either .05 or .08 of an acre. The plant breeding work is divided into rows of various standard lengths. The original plant selections are grown in head rows, five feet long. The second generation is grown in rod rows and the third generation in eight rod rows. Elimination each year is practised in order to keep the work within bounds. The best material from the third generation or eight rod rows is promoted to preliminary field plot tests in .01 acres. Such material is tested for a time in these plots. After this preliminary test, an effort is made to determine whether or not any of the selections or material from the breeding nursery is fit to be promoted to the standard test. Before any seed is distributed, thorough tests are made in standard plots for a long enough time to determine whether there is any possibility of its being valuable for the agriculture of the province. A few varieties are selected from the standard tests and are increased in larger fields on the seed farm which is conducted by the department on land belonging to the University. An opportunity is

also had for increasing the seeds upon the plots used for conducting field management experiments of various kinds as well as upon the seed farm. The seeds thus obtained are distributed to Saskatchewan farmers at reasonable prices. The amounts sent out are usually limited to enough to seed ten acres. This varies slightly with different crops. During the season of 1922, 80,000 pounds of seed were distributed in the spring and 195 acres were sown on University land and produced a very fair crop, which was distributed during the ensuing winter.

The Experimental Field

The experimental field contained 4,378 plots or rows. During the past season 1,756 of these units were devoted to the study of forage crops and 2,622 were devoted to the study of grain crops. The investigation work includes the breeding of alfalfa and testing out varieties to determine their hardiness, yield, etc. Similar work is conducted with sweet clover and brome grass as well as western rye grass. These are the four leading grass or hay crops for Saskatchewan, and attention is centred upon them for the sake of developing better producing strains and learning as much as possible regarding methods of production. The work with cereals includes all of the suitable crops produced in the province, that is, wheat, oats, barley, rye, flax, peas, and emmer. Wheat, oat and barley breeding are in progress as well as a limited amount of plant breeding in connection with rye and flax. Of these plots, 130 are devoted to a test of the plant food requirements of the soil in co-operation with the Soils Department. The latter department furnishes the plan for the project and the Field Husbandry Department conducts the work upon the investigation fields.

New Projects

Some of the new projects include tests to determine the best fallow substitute, studies in connection with the rotation of crops, as well as an experiment with winter wheat which promises to be interesting. The summer fallow substitutes project includes the growing of corn, potatoes, sunflowers, millet, wheat, oats, barley, and Sudan grass in rows in comparison with summer fallow. All the plots receive uniform, thorough cultivation, and wheat is to be planted upon each of the plots alike in order to determine the effect upon the growth of wheat of the various crops grown under cultivation, as compared with the yield of wheat on summer fallow. The rotation project will include a study of the fundamental principles of crop rotation which will include a study of crop rotation involving the growing of the more important crops continuously upon the same ground as well as in two or three or six-year rotation. All the experimental work is duplicated with the exception of the soil fertility or plant food test. Owing to limited space available, it was thought best to get along without duplicates with this project, in the hope that fairly accurate results might be obtained by continuing the project through a long period of years and striking averages. All this investigation work, and seed distribution is carried on with the primary object of producing results of value to Saskatchewan farmers.

Co-operative Experiments

The seed distribution work and the results of the investigation field are followed up by means of co-operative experiments with members of the Field Husbandry Association. This Association consists of about 800 farmers who are conducting field tests of various kinds voluntarily in

co-operation with the Field Husbandry Department. From the reports obtained from these men it is possible to check up the results obtained on the experimental plots at the University. Further than that, the experiments conducted by these men often result in an increased interest upon the part of their neighbours in some crop or variety or method of culture for their particular locality. The co-operative experiments during the past season included the growing of grain in rows as summer fallow substitutes, the growing of two varieties of corn representing the leading varieties of Dent and Flint corn, the trial of grass on alkali land, and the increasing of pedigreed seeds from the University.

Instructional Work

Approximately 200 students received instruction in the class rooms and laboratories of the department during the past year. The work begins with a course in Crop Production by Professor Champlin, which introduces the subject of growing crops in Saskatchewan, including tillage methods, fundamental principles of plant growth and the study of the principal varieties. The texts used for this course were prepared by Professor John Bracken, formerly head of this department, under the titles "Crop Production in Western Canada," and "Dry Farming in Western Canada." These texts are published by the Grain Growers' Guide of Winnipeg. The second year students are given thorough technical training in the production of cereal crops in North America, including the study of several score of varieties, with the object of making them thoroughly familiar with grain production methods and varieties of this continent. This course is in charge of Professor Goulden. The text used was prepared by Mr. R. Carleton, cerealist, United States Department of Agriculture. In the third year, Professor Kirk introduces the students to a technical study of forage crops, including alfalfa, sweet clover, timothy, brome grass and all of the crops that can be used to advantage for forage purposes. This course also includes a study of the more important weed enemies. In the fourth year the students are permitted to specialize. Those specializing in Field Husbandry are given a course in plant breeding by Professor Kirk, attend a Seminar and prepare a term report under the direction of Professor Champlin. All of the courses except the Seminar include laboratory work, supplemented by lectures and text book reading. It is thus possible to give the students three full courses during the first three years in Field Husbandry, and those who wish to specialize in this subject are given the fourth year's work including two full courses.

Publications

During the past year the department issued eight bulletins, including such subjects as milling value of Saskatchewan wheat, leading varieties for Saskatchewan, winter grain in Saskatchewan, etc. The department also answered about 4,000 letters of personal inquiry from farmers, and prepared a large number of mimeograph circulars and press articles for the purpose of distributing such information as was available to the public. The best co-operation has been available at all times from the press of the province and the farm papers published at Winnipeg which circulate within the province. This has proved very valuable in connection with this phase of our work.

Extension Work

It is the policy of the University for the several departments to co-operate with the Extension Service

in furnishing lecturers for meetings of the local Agricultural Societies and Grain Growers' Associations. In connection with this work the Field Husbandry Department reached a total of 2,937 or an average per meeting of 184 persons. This does not include similar work done in connection with the Better Farming Train which tours a part of the province each year. During the past year the train reached approximately 25,000 people who attended the lectures and demonstrations. In connection with the correspondence and extension work, 13,351 bulletins and circulars were mailed from this department.

MARKETING SERVICES, ALBERTA

By COLIN G. GROFF, Publicity Commissioner

THE co-operative marketing services provided by the Alberta department of agriculture, have played a very important part in the past few years, in establishing the dairy and poultry branches of farming on a more sound and permanent basis in the province.

The benefits of such services, provided during the years when agriculture in Alberta has been emerging from the pioneer stages, are now in full evidence. The farmers of Alberta, turning to-day from the wholesale cropping of grain, are seeking the safer and more substantial paths of diversified farming, and are displaying keener interest than ever before in the development of dairying, poultry raising and other branches of intensified farming. As a result of the co-operative services provided by the government, they find conditions existing under which they are enabled to market their products with the assurance of receiving full and complete recompense for their efforts in the production of quality.

Particularly in this so with reference to the dairy industry, as Alberta now occupies an enviable place in this industry in Canada, due to the services rendered by the department of agriculture, and to the very high state of co-operation now existing among all concerned in the industry to establish an unimpeded channel of trade between the producer of quality butter and the ultimate consumer.

In the earlier years of the province when the dairy industry was in its infancy, the dairy branch of the department itself operated a number of the creameries in the province, and marketed co-operatively more than half the butter output. In 1911, however, the status of the industry had improved to such a degree that the government operation of creameries was discontinued, the marketing service being maintained. By means of this service, the department undertook to market co-operatively whatever surplus product was offered, at the best price obtainable, agreements or contracts being entered into with each shipper.

During the years from 1912 onward the department has been marketing under the co-operative scheme between seven and ten per cent of the creamery butter output. In the year 1912 a total of 278,688 pounds was marketed. In 1921 the amount had increased to 852,000 pounds. The demand for the service is not so great as in former years, for the reason that the service has now accomplished one of the objects sought at its inception, namely, assistance in the stabilization of the industry and the establishment of a commercial

standardized grading system whereby the producer of quality butter would be guaranteed the top price for his product no matter where or how he marketed it. That condition exists in Alberta to-day, thanks to the services rendered by the department, and to the splendid co-operation, which has been built up among the producers and manufacturers and all other interests, to maintain the high standard reached by the industry.

Another notable success in co-operative marketing has been realized by the department of agriculture in the handling of poultry products. The remarkable manner in which the volume of business handled by this branch of the service has increased, is evidence of the benefit it is proving to the poultry producers and the industry in general.

The poultry marketing service is operated by the conjoined efforts of the officials of both federal and provincial poultry branches. The federal officials undertake a portion of the necessary field work in the education of the farmer in the use of the service, while the provincial department of agriculture handles the actual marketing of the produce, two stations being established at Calgary and Edmonton. In addition to this the provincial department does a certain amount of the field work.

The objects of this marketing service, as was the case in dairy products, is four-fold, namely: To provide an alternative outlet for those who are not satisfied with their present market. To establish a system by which quality will be recognized and the producer paid on that basis. To encourage better methods of handling the product. To develop additional markets and to stimulate a demand for the Alberta product.

The net price returned to the farmer represents the full market price possible for the product, less deductions for handling expenses and the establishment of a reasonable reserve fund.

The egg marketing service was inaugurated in 1917, when a total of 13,326 dozen eggs was handled. In 1918 poultry marketing was also undertaken, and 14,863 head were marketed. The volume of eggs handled that year had increased to 137,370 dozens. More than 80 points in the province took advantage of the service. The manner in which the business handled by the poultry marketing service has increased from year to year is set forth in the following figures:—

Year	Eggs	Poultry
1917	13 326 doz	
1918	137 370 "	14 863 head
1919	71 894 "	68 000 lbs.
1920	171,000 "	110,385 lbs.
1921	177 800 "	203 000 lbs.
1922	435 830 "	557 000 lbs.

The very large volume of business handled during 1922 represented direct shipments from 417 individual farmers as well as shipments from egg circles with a membership of 455 farmers. A total of 158 points in the province shipped products to the government during the year.

In addition to this volume of business, shipments were also undertaken of live poultry to Montreal and Vancouver, and the results were satisfactory considering conditions. Five cars of live poultry went into the British Columbia market. The co-operative shipping of poultry by live weight from country points to the plant at Edmonton was also undertaken very successfully, the saving in freight as compared with express being considerable. A total of 15 cars of live poultry was shipped from eight different points in the province, the saving in transportation charges ranging from $1 to $5.60 per cwt.

Under the auspices of the marketing service, community killing of turkeys

was developed to a large extent. In 1921 a total of 45,000 pounds of turkeys was handled, resulting in very satisfactory returns to the producer over the ordinary market prices. In 1922, this business had increased to 128,000 pounds.

It is obvious, therefore, that this service has benefited the industry to a very great extent, although it is difficult to estimate this benefit in actual dollars and cents. In all case; the producers have received the best market price possible, in many cases the return to them being more than would have been received in the ordinary marketing channels.

The importance of such marketing services in the improvement of grade and in the extension of markets for Alberta produce, has been established. The quality of both dairy and poultry products has been noticeably improved during the past few years, and the extension of markets has followed as a matter of course. Alberta butter is being marketed abroad in increasing quantities from year to year. Alberta eggs and poultry have also found their way to markets in the East and in Great Britain. Last year a large proportion of the egg stocks held by the marketing service of the department found its way to markets in Great Britain.

With success attained in these branches of service, the department of agriculture last year added another marketing service to its list, namely, the co-operative handling of registered seed grain. This year about 15,000 bushels of Alberta's best seed is being marketed in this way, much of this grain finding its way across the line and into Eastern Canada. The manner in which the farmers have received this latest service is most encouraging, and the prospect is that a much larger volume of seed grain will be handled next season.

The new service handles nothing but registered seed grain, and handles it at a price that gives the producer a substantial return, but is not prohibitive to the buyer. The producer consigns his seed to the government plant at Edmonton, and receives an advance of 65 per cent of the price, the balance being paid to him on disposal of the grain and after deduction of handling expenses. In this connection the department has installed what has been conceded to be one of the most modern and complete cleaning and grading plants in Canada, and has set itself definitely to the accomplishment of a great improvement and development of the production of registered seed grain in the province.

THE WORK OF THE QUEBEC AGRICULTURAL ASSOCIATIONS

By OSCAR LESSARD, Secretary of the Council of Agriculture

AMONG the various agricultural organizations in which the province of Quebec takes pride, the Agricultural Associations and Farmers' Clubs, which, in their respective lines, bring about the cooperation of farmers towards a common aim, that is, the progress of agriculture, are worthy of special mention.

There are, in the sixty-five counties of Quebec, 89 agricultural associations, operating regularly and numbering over twenty-two thousand members, whose annual fees make a total of some $40,000. Under the wise administration of the directors of the associations, this amount is spent on various agricultural activities such as the promotion of

breeding, the organizing of competitions, the purchasing of agricultural implements and pure-bred stallions, the giving of prizes to fairs and exhibitions, in short, the stimulation and encouragement of progress in all directions. The results of this work have been very gratifying and the general prosperity of the province has been greatly increased thereby. Each year, considerable progress in the various lines has been noted by those who keep watch over the development of agriculture.

Of course, agricultural associations are not left to themselves by the Government. Their activities are closely followed by the provincial Department of Agriculture, which endeavours to co-ordinate the same and to direct them along the proper lines. For this purpose, lecturers, expert breeders and judges are placed at the disposal of the associations, and advice and information are given by the Council of Agriculture, in order to enable the associations to reach the object towards which they strive, which is, to facilitate the task of the farmer, and gradually, but surely, to develop agriculture in all its phases and in the general interest of the community.

During the last few years, special encouragement has been given by the associations to the breeding of horses, to enable the farmers, by means of premiums, to purchase high-class stallions. To facilitate this work, the Department of Agriculture granted for this purpose about $15,000 last year, and there is no doubt that this form of encouragement will be continued in the future, as it gives highly satisfactory and gratifying results, especially since the system of recording stallions was inaugurated some three years ago.

The associations also receive a regular grant from the Government, the total amount of which was over $47,000 last year. In addition to this, the Department of Agriculture subsidizes a great many live stock, ploughing, field crop competitions, etc., which are open to adult farmers as well as to their sons, who are thus encouraged to improve their methods and who take greater interest in their work on account of the prizes and honours that they receive.

Altogether, the work of the agricultural associations in this province is extremely useful, and the farmers, who take a pride in maintaining their province in the high place which it occupies in this Dominion, co-operate actively with the boards of directors, through which the various moves and schemes of development are initiated.

EARLY LAYING—ITS ECONOMIC SIGNIFICANCE

By M. A. JULL, Macdonald College, Que.

IT is apparent that to whatever extent the month that laying commences may influence monthly and annual production, to such an extent the month laying commences will be of considerable economic significance. It has been shown previously (Jull, 1923) that the value of the rate of monthly production is determined primarily by the prevailing price of eggs at the time of production. It was shown that the rate of production in Barred Plymouth Rocks and S.C. Rhode Island Reds at Macdonald College reached the highest values during the months of August to February. The data on which these observations were made dealt with the production and price of eggs for the period from November to October inclusive, which has been the customary period of treating most of the data from various sources dealing with egg production. This is to be expected, since practically all of the laying contests, which have supplied most of the available data, are organized to commence on the first of November of each year. On the other hand, if it can be demonstrated that the month that laying normally commences influences subsequent production, then it is of considerable economic importance to determine the month of the year that laying should commence in order that the annual production shall have the greatest value. This, then, is the object of the present paper.

The annual egg production records of 411 Barred Plymouth Rocks are classified according to month that laying commenced The four months of September, October, November and December are considered, inasmuch as most birds start to lay in October or November while a few early-hatched ones may start in September and late-hatched ones usually start in December. The monthly prices of eggs used to determine the value of monthly production are the average of the prices of eggs at country points in the province of Quebec for the three laying years 1918 to 1921 inclusive. They are as follows in cents per dozen: January, 67; February, 55; March, 45; April, 41; May, 40; June, 41; July, 45; August, 49; September, 53; October, 55; November, 63; December, 70.

Table I shows the number of birds that commenced laying in each of the four months, September, October, November and December, and the average number and value of the eggs laid by each group of birds and for the total number.

TABLE I.—SHOWING THE AVERAGE NUMBER AND THE AVERAGE VALUE OF EGGS LAID PER BIRD ACCORDING TO MONTH LAYING COMMENCED AND THE TOTAL

Month Laying Commenced	No Birds	Average No. Eggs per Bird	Difference	Average Value in $ of Eggs per Bird	Difference
September ...	70	153·78 ± 2·13		6·47 ± 0·06	
October ..	96	175·32 ± 1·34	21·54 ± 2·52	7·59 ± 0·06	1·12 ± 0·08
November	173	159·71 ± 1·04	15·61 ± 2·37	6·80 ± 0·05	0·79 ± 0·08
December .	72	146·18 ± 1·82	13·53 ± 2·09	6·06 ± 0·08	0·74 ± 0·09
Total.	411	159·99 ± 0·76		6·80 ± 0·03	

It will be observed, from Table I, that both the average number and the average value of eggs laid per bird was highest for the group of birds that commenced laying in October, with November second, September third and December fourth. In every case differences with their probable errors are significant. Consequently, it is obvious that the time laying normally commences does affect quite materially the value of the annual production. The particular point to be emphasized is that, not only do birds commencing to lay in October lay more eggs than birds commencing in November but that the relative value of their eggs is also higher.

The same information as shown in Table I is shown in graphic form in Fig. I.

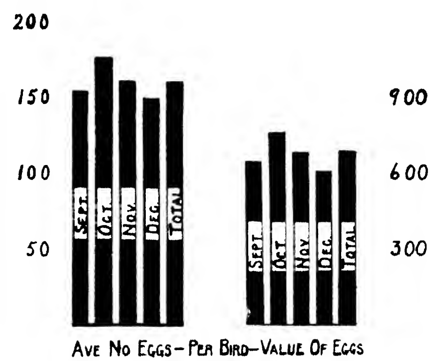


FIGURE I

TABLE II.—SHOWING FREQUENCY DISTRIBUTION OF EGG PRODUCTION IN CLASSES OF TEN ACCORDING TO MONTH LAYING COMMENCED AND THE TOTAL

Class	Frequencies				
Eggs per Bird	Sept	Oct	Nov	Dec	Total
51 — 60				1	1
61 — 70	1			0	4
71 — 80	0			1	1
81 — 90	2		1	1	4
91 — 100	1		1	2	4
101 — 110	1		3	3	7
111 — 120	5	4	9		2[illegible]
121 — 130	4	2	11	8	[illegible]
131 — 140	3	6	18	6	33
141 — 150	4	9	22	12	47
151 — 160	12	6	24	8	50
161 — 170	8	12	25	6	51
171 — 180	11	13	18	6	48
181 — 190	2	10	14	6	32
191 — 200	7	16	14	0	37
201 — 210	3	8	5	4	20
211 — 220	3	8	3	0	14
221 — 230		2	2	1	5
231 — 240			1		1
241 — 250			2		2
Total	70	96	173	72	411

TABLE III —SHOWING FREQUENCY DISTRIBUTION OF VALUE OF EGG PRODUCTION, IN CLASSES OF $0 50, ACCORDING TO MONTH LAYING COMMENCED AND THE TOTAL

Class	Frequencies				
Value in $ of Eggs per Bird	Sept	Oct	Nov	Dec	Total
2 51 — 3 00	1			1	2
3 01 — 3 50	4			1	5
3 51 — 4 00	2		1	1	4
4 01 — 4 50	1		4	6	11
4 51 — 5 00	7		9	7	23
5 01 — 5 50	3	5	12	9	29
5 51 — 6 00	2	4	22	6	34
6 01 — 6 50	11	10	26	17	64
6 51 — 7 00	10	11	19	8	48
7 01 — 7 50	12	17	34	7	70
7 51 — 8 00	5	12	18	4	39
8 01 — 8 50	5	12	11	1	29
8 51 — 9 00	4	12	8	1	25
9 01 — 9 50	3		4	2	16
9 51 — 10 00		6	2	1	9
10 01 — 10 50			1		1
10 51 — 11 00			1		1
11 01 — 11 50			1		1
Total	70	96	173	72	411

The frequency distributions shown in Tables II and III bring out the fact that there is less variability both in respect to the number and value of eggs produced by the October and November groups as compared with the September and December groups of birds Also, the October as compared with the November group has a larger proportion of frequencies in the classes of greater magnitude

In order to compare the results, on a percentage basis, of the September, October and December groups of birds with the November group, since November has always been considered by various authorities as the logical month to have laying commence, the November production and value figures are placed at 100 in Table IV and the figures for the other months are shown as percentages

TABLE IV SHOWING PER CENT PRODUCTION AND VALUE OF EGGS FOR THE OTHER THREE MONTHS ON NOVEMBER PRODUCTION AND VALUE

Month Laying Commenced	Per Cent Production	Per Cent Value
September	96 29	95 15
October	109 77	111 61
November	100 00	100 00
December	91 53	89 12

Another way of looking at the same matter is to compare the actual value of the eggs produced according to the month laying commenced. The actual value, in cents per dozen, of the eggs laid by the four groups of birds is as follows: September, 50·00; October, 52·00; November, 51·00; December, 49·50. The differences here do not seem very great, but it must be remembered that the average for the October group than for the November group. The explanation for this is shown in Figure II, which gives the monthly distribution of the average number of eggs laid per bird for the different groups. It will be observed that the rate of production for the October group was higher than that of any other group during the months of November, December, January and February, the season of

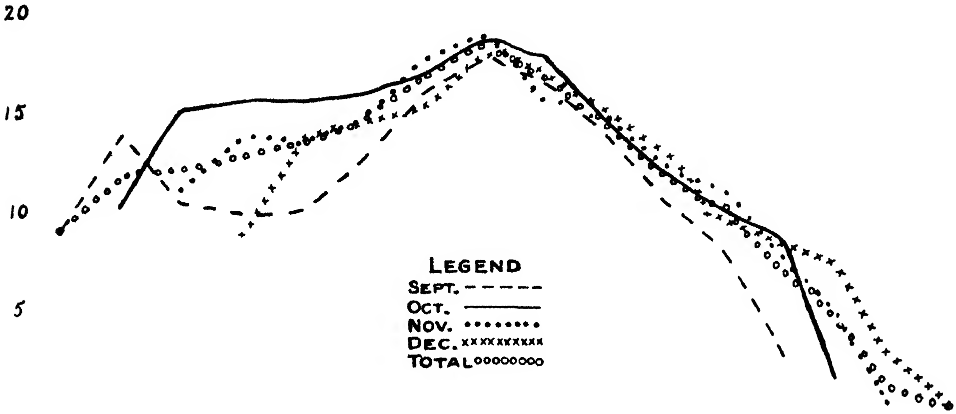


Figure II. Showing the Monthly Distribution of the Average Number of Eggs Laid per Bird.

Sept	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
9·24	13·96	10·51	9·94	10·21	12·89	16·23	17·98	16·64	14·28	10·61	8·33	2·94	.....	...	....
...	10·31	15·23	15·77	15·79	16 11	17·14	18·90	18·06	14·83	12·27	10·16	8·88	1·83	......	...
...	......	11·39	13·95	13·75	14·84	17·83	19·13	15·98	14·94	12·84	11·24	7·88	5·48	0·79	..
....	....	....	8·83	13·97	14·61	15·58	18·17	17·06	15·11	13·28	9·76	8·50	7·71	3·07	0·49
9·24	11·85	12·30	12·80	13·68	14·77	17·00	18·71	16·77	14 84	12·26	10·24	7·38	4·92	1·46	0·49

production per bird differed for the four groups, October production, for instance, amounting to 175·32 eggs as compared with November production of 159·71 eggs.

The two outstanding features developed in this paper have been: first, that Barred Plymouth Rocks at Macdonald College which commenced laying in October laid more eggs per bird than those which commenced laying in November; second, that the relative value of the eggs is greater highest prices. The rate of production for the September group is interesting from the fact that there was a noticeable drop in the rate during the months of November, December and January and that after May the rate dropped more perceptibly than in the case of the other three groups. The rate of production after April in the October, November and December groups followed much the same trend.

For the sake of emphasis, it may be repeated that the outstanding observation of this study is that the October group of birds is a more valuable gross revenue-producing group than any other group, not only because the annual production is greater, but, also, because the rate of production is greater during the season of higher prices. The more that spring and summer egg prices decrease relatively to fall and early winter prices, which seems the tendency, the more economically significant becomes the rate of production during the fall and early winter months.

The conclusion seems justified that, to whatever extent is possible, which will be discussed in a subsequent paper, birds should be hatched and reared in order to commence laying in October and that laying contests should be organized to start the first of October instead of the first of November.

LITERATURE CITED

Jull, M.A., 1923, The Relative Value of the Monthly Distribution of Egg Production, Sci. Agr., Vol. III, No. 8, pp. 276-284.

PART III

Agricultural Education and Related Activities

THE ONTARIO LONG COURSE SCHOOLS

By L. STEVENSON, B.S.A., Secretary and Supervising Director, Department of Agriculture

In Ontario, winter classes in agriculture and in domestic science are held by the Agricultural Representatives, and during the duration of the Agricultural Instruction Act 4,000 farm boys have benefited. Out of these classes have grown the junior farmers' organizations; of which there are 104 within the province, with a membership of 2,815. These organizations are the basis of the pig clubs, calf clubs, and various competitions in crop production, all of which are of great practical value. The three-months' courses in agriculture and domestic science now held at eight centres in the province are a similar development.—*Editor.*

THE Three Month Courses or Long Course Schools in Agriculture and Domestic Science, were organized in 1921-22 as an extension activity of the Agricultural Representatives Branch of the Ontario Department of Agriculture, in four counties, Middlesex, Huron, Peel and Wentworth. The courses were very successful, and the various groups of progressive people making use of the Agricultural Representatives' services in those counties were very desirous that the schools be repeated in 1922-23. Four other counties, Simcoe, Leeds, Prince Edward, and Peterboro' asked that the Three Month School service be extended to them. This made a total of eight counties benefiting by this form of extension work during the past winter.

The Agricultural Representative selected the location for the school in his county, arranged with the municipal authorities or others concerned for the use of buildings, grants for running expenses, equipment, prizes, and other minor essentials necessary to conduct a well organized school for rural youth.

The resident faculty at each point where a school was held consisted of the Agricultural Representative, the Assistant Representative, the Domestic Science assistant and the instructor in English and Mathematics. The travelling faculty, visiting all the schools for a definite period in accordance with a well-ordered plan, was made up of the best instructors available. This faculty was composed largely of college and university graduates with teaching experience. The Domestic Science class at each school had the benefit of a resident domestic science teacher, who in turn was assisted by the visiting specialists.

Classes were assembled at 9·30 each morning, except Saturday, and continued until four o'clock in the afternoon.

The regular students at the eight schools made a grand total of 239 boys and 260 girls. Many occasional students attended the classes of special interest to them. Literary and debating societies were organized in connection with each school.

The cost of these schools has been very low when compared with the cost of the permanent school, being

but $16 per student for the three month period, a mere trifle for well organized schooling in elementary agriculture and domestic science.

The schools were held at the following points, Clinton, Parkhill, Streetsville, Binbrook, Norwood, Wellington, Mallorytown and Orillia.

The classes in Agriculture received instruction in Animal Husbandry, Agricultural Botany, Horticulture, Farm Drainage, Soils and Fertilizers, Apiculture, Farm Mechanics, Poultry Husbandry, Farm Dairying, Farm Management, Farm Forestry, Economic Entomology, Elementary Chemistry and Physics, Civics and Rural Organization, Co-operative Marketing, Veterinary Science, Gas Engines, English, and Mathematics.

The classes in Home Economics received instruction in Sewing, Home Nursing, Foods and Cookery, Laundering, Household Administration, Millinery, English, and Mathematics. All Domestic Science students may elect to attend the classes in Poultry, Apiculture, Dairying, and Horticulture. Special lectures on subjects of interest were arranged from time to time.

Schools of this type take the college teaching into the back districts and reach young people who can not for various reasons attend the permanently organized Agricultural College at Guelph.

AGRICULTURE IN MANITOBA HIGH SCHOOLS

By R. B. VAUGHAN, Director of Technical Education

Aim and Purpose.—To develop the student's interest in the things of nature including plants, insects, birds, animals, etc., and through this aroused interest to give him a conception of the economic importance of these matters in practical agriculture.

To show that by controlling the forces of nature improvement may be made in soils, plants and animals to his own economic benefit.

To create by investigation and experimental work a scientific attitude of mind, and through the project method to give an opportunity of participation in practical production.

Policy Pursued.—To make the agricultural work of the high school appropriate to its immediate surroundings. To make the work of the school and appearance of the school lands reflect "character" that is sound, attractive and educational.

Method of Treatment.—Nature study and elementary agriculture in the grades is carefully organized so that students begin work in high school with an interest in birds, insects, plants, trees, wild animals, etc., and with a tendency for investigation. In Grade IX this natural interest is utilized by beginning the more scientific study of entomology. The student now studies the characteristics of insects by making collections of different species, and studies in particular the methods of control of about a dozen of the most injurious kinds prevalent in his own district. Birds are studied in the relationship of their economic importance to the control of insects. Horticulture is also taken in this grade and includes a study of the growing of fruits, flowers, vegetables and trees. The home is surrounded with such life and the interest in these things is natural. In the growing of fruits, the following factors are studied in considerable detail: Requirements and preparation of the soil; selection and purchasing of stock with the necessary care en-

tailed previous to and during planting; appropriate cultivation; protection from the weather, insects, diseases, etc.; gathering and marketing of the fruit. Similar study outlines are followed in the study of vegetables, flowers and trees. Considerable attention is given to improvement of plants by selection, to the construction and management of hot beds and cold frames and to the improvement of grounds. In addition to the school plots, the home project work is carried on and stimulated by home garden contests carried on under the Boys' and Girls' Clubs. These gardens are supervised and judged during the summer and prizes awarded for the best ones. The teacher of agriculture spends considerable time very profitably by becoming an extension worker during the holidays. These plots furnish the exhibits for the annual fairs of the boys' and girls' clubs.

In Grade X, Botany and Field Husbandry are combined. By this method the study of how a plant lives and grows, produces seed and fruit is treated in its proper relationship with the practical method of creating the best conditions for the plants comprising commercial crops. Due consideration is given to the suitability of field crops to different soils and their economic value due to use, marketing conditions, etc.

In Grade XI, Animal Husbandry is the main topic. Horses, cattle, sheep, swine and poultry are studied from the standpoint of history, classification, breeds, characteristics, care, feeding, breeding, exhibition, marketing and judging. As in the work of the preceding grades the local conditions are kept constantly in mind particularly with reference to selection, feeding and marketing. Practice in stock judging is given at the near-by farms. Pig, calf and poultry clubs are formed, and their very favourable progress is noted by the exhibits at the annual fair.

Progress.—The work as outlined receives credit in the regular high school course, either for entrance to normal school or to the University, and may be said to have been carried on under probationary conditions. So far as can be ascertained, the results are fully up to the expectations and giving satisfaction from the standpoint of cultural, scientific and practical education. The work carried on at Teulon, Man., under the efficient direction of Mr. S. E. Clarke, B.S.A., has become an enterprise of community significance. Some boys under his direction have produced enough good seed to sow their fathers' fields.

POULTRY CLUB WORK IN NEW BRUNSWICK

By F. LESLIE WOOD, B.S.A., Poultry Superintendent

BOYS' and Girls' Club work began in New Brunswick with the organization of two pig clubs in 1917. The following year poultry clubs were first organized, and since that time poultry club work has played an important part in the work of the Poultry Division. During the five years the work has been in progress forty clubs have been organized with a total enrolment of 521 members. To these members have been distributed 23,442 eggs and 1,290 day-old chicks, all of bred-to-lay strains of Barred Plymouth Rocks.

Below are given the rules and regulations under which the Boys' and Girls' Poultry Clubs have been organized in New Brunswick and the contract entered into by the members with the Department of Agriculture.

RULES AND REGULATIONS

Boys' and Girls' Poultry Clubs

1. Club members must agree to the breed selected by the Poultry Division of the Department of Agriculture.
2. A club must have at least fifteen (15) members.
3. Boys and girls between the ages of twelve (12) and eighteen (18) years may become members of the Boys' and Girls' Poultry Club.
4. No boy or girl may join a poultry club without the consent of parent or guardian.
5. Boys and girls cannot join a poultry club unless they have the proper facilities to care for the poultry at all seasons of the year or agree to provide the same according to instructions from the Poultry Division. Members must have proper feed available.
6. Members of the Poultry Club must mark their poultry of all ages in such a way as will distinguish it from other poultry raised on the same place. The members' club chickens should be raised in a separate place to other chickens if possible.
7. The club must hold an annual Poultry Fair in the fall of each year, the date selected subject to the approval of the Poultry Division. The Poultry Club Fair shall be held in conjunction with the Pig Club Fair in the same locality, and if possible on the same date as the local fair of the district.
8. All members of the club must show all their chickens at the Club Fair.
9. An annual membership fee of twenty-five cents (25c) shall be paid to the secretary-treasurer of the club by each member at the time of joining. This money shall be devoted to carrying on the business of the club.
10. The annual meeting shall be held some time in January of each year when the officers for the ensuing year will be elected by ballot. Club meetings shall be held regularly every two months, in the months of January, March, May, July, September and November. Dates of all meetings are subject to approval of the Poultry Division. This will permit the more frequent attendance of speakers arranged for by the Poultry Division.
11. Special meetings may be called by the president at any time to transact important business.
12. The secretary-treasurer shall notify all members when either a special or a regular meeting is to be called.
13. Twice a year or oftener the Poultry Division will arrange for a representative to speak at the club meetings and to discuss important problems with the club.
14. The Poultry Division will supply the president of the club with papers on poultry husbandry which shall be read at the regular meetings of the club by members appointed by the president. He shall also appoint a member to lead in the discussion after the reading of the paper.
15. I hereby agree to abide by the rules of the above club and do everything in my power to promote its interests.

Signed ....

Date....................

CONTRACT

Boys' and Girls' Poultry Clubs

This contract made and entered into by and between Poultry Division, Department of Agriculture, Fredericton, N.B., Party of the first part, and .... Party of the second part, of the county of ....and Province of New Brunswick.

Witnesseth: That the party of the second part has this day secured from the party of the first part (50) Barred Plymouth Rock eggs which he or she agrees to take possession of and incubate according to instructions given by party of the first part.

That party of the second part further agrees:

To raise, feed, house, breed and market the chickens hatched from the eggs supplied, and their progeny, for two years, according to instructions from party of the first part.

To become, at the same time, a member of......................Boys' and Girls' Poultry Club, to bind himself or herself to abide by the rules and regulations of the club for two years to the best of his or her ability, to exhibit when called upon, all the chickens raised from the eggs supplied by party of the first part, at the club poultry show.

To return to party of the first part, in the fall of the year, one strong healthy chicken for each (12) eggs or (6) day-old chicks supplied, (4) chickens, or in the spring of the second year the same number of eggs of as good quality as were supplied to him the first year, whichever party of the first part desires, and to sell to party of the first part, at a rate not exceeding ....cents each, as many other eggs laid during the hatching seasons of 192.. and 192.. by birds hatched from eggs supplied and their progeny, as party of the first part desires.

To return to the Poultry Division a complete record each year for two years of all chickens hatched from eggs supplied, and their progeny, according to the provisions on record blanks furnished.

If sufficient chickens to fulfil this contract are not raised, party of the first part sustains the loss.

If for any reason either party shall fail to fulfil this contract or any part thereof he shall forfeit all right to the eggs, chickens hatched from them, or their progeny.

In testimony whereof the parties have hereunto set their hands this the .... day of ....192...

............Party of the First Part.

............Party of the Second Part.

I hereby consent that Party of the Second Part may enter into the above contract.

........................192..

.................Parent or Guardian.

While in many other places where poultry clubs are conducted members are permitted to make a choice of varieties it was thought advisable to adopt only one variety for the work in New Brunswick. It was believed this would assist in the standardization of our poultry, the advisability of which cannot be questioned. The principal reasons for choosing the Barred Plymouth Rock breed were, as follows:

They are one of the best utility varieties, if not the best, and well suited to the farmers' needs.

Many of the Canadian and United States Experiment Stations had recognized them as such and had produced and distributed heavy laying strains.

They are the most popular and most extensively raised variety in New Brunswick.

A sufficient supply of eggs of any other suitable variety, from a nearby source, would have been impossible to obtain.

While poultry club work may not have been carried on to as great an extent as in other provinces or states, it has been encouraged so far as the resources of the Poultry Division would permit, and it is planned to continue the work.

Why are our governments laying such stress on boys' and girls' club work? There are several reasons. In many cases clubs have been started primarily to increase production of some breed or class of livestock of which larger numbers were needed.

Such has been the case in New Brunswick. The primary function of the boys' and girls' poultry clubs has been the introduction and propagation of improved strains of utility poultry. Previous to their organization but little attention had been paid to egg production in the province, and the poultry clubs were aimed to serve as community breeding centres from which quantities of high-class breeding stock and hatching eggs would be available in a short time.

A second reason for carrying on club work has been to get farm boys and girls interested in farm work and in this way stop, to some extent, the rural depopulation which has been going on for so long to the detriment of the farming communities. Club work furnishes an effective means of reaching, holding and directing the interest and energies of boys and girls who are without as well as within the schools, and so promotes the betterment of the social, educational and economic conditions affecting country life.

A third reason for carrying on the work is its educational value. A club may aim to educate its members only along one particular line of work, but the interest aroused is extended to other matters and to the improvement of rural conditions generally. Gradually but surely club members learn that it is not all of farming to drudge; that there is abundant opportunity to plan, study, investigate: that intelligence and culture are needed on the farm, and that the proper exercise of these qualities will yield as abundant returns in the country as in the city.

The poultry club fair held annually in each district where a club has been formed has been of great educa-

tional value. The persons who judge the fowls exhibited make an effort to point out the points of excellence or the deficiencies of the different birds, and thus each member has the opportunity of gaining valuable information.

Club members have been visited as often as time would permit, and individual assistance has been given in the many problems that confront the poultry breeder. Meetings have been held and demonstrations of different kinds given in an effort to give all the information possible to interested members.

Finally, by bringing together the boys and girls at club meetings and club fairs, social conditions may be improved. This is particularly so in outlying rural districts where isolation has been the greatest hindrance in agricultural progress. If the social instinct of the boys and girls can be developed in this way, a vast amount of good will result.

I wish to mention briefly some of the results that have been attained by club work in New Brunswick It has wielded a widespread influence for more and better poultry. There is plenty of evidence to show that the clubs have fulfilled the primary function for which they were instituted—to assist in the transfusion of heavy-laying strains of poultry. Even in sections far removed from club flocks, birds are found that bear unmistakable traces of the blood of strains introduced for distribution to poultry clubs. In many cases the clubs have demonstrated that poultry raising is a successful venture where it had been viewed with doubt previously. It is not to be expected that every club member will become an enthusiastic poultry breeder, but the work has brought to light a large number of enterprising boys and girls who are greatly interested, and are making a financial success of poultry raising. Frequently the parents have become interested through the success of their children and, with the parents approval secured in this manner, the chances for continued success look exceptionally bright.

The standing made by fowls bred by club members in the laying contests during the past four years speaks well for the results of the members as breeders and for the quality of the stock introduced by the Poultry Division for distribution through the clubs.

The first Egg Laying Contest in which club members from New Brunswick took part consisted of twenty pens and was held at the Dominion Experimental Farm at Charlottetown, P E.I. At the close of the eleven month period the pens owned by the two club member entrants from New Brunswick stood third and sixth respectively.

A contest running for the full period of twelve months, was held the following year at the Dominion Experimental Farm at Nappan, N.S. Five pens were entered from New Brunswick poultry clubs and these won the first, third, fourth, fifth, and sixteenth places with twenty pens competing.

In the fall of 1920 the first New Brunswick Laying Contest began at the Dominion Experiment Station, Fredericton, with twenty-one competing pens of which four were owned by club members. At the conclusion of the contest these stood in seventh, ninth, tenth and twelfth places.

At the second New Brunswick contest which ended October 31, 1922, poultry club members claimed second, third and thirteenth places among twenty competing pens.

This record is considered particularly good since club members were competing against old and experienced breeders and against the best stock that the Experimental Stations had produced.

If individual members of a club were unable to make up a sufficiently promising contest pen, a number of members contributed the best from their flock and the pen was entered as a club pen. The advertising gained by successful participation in egg-laying contests has created a demand from the members of these clubs, and the members have thus had a valuable lesson in the benefits of organized effort.

Not only have club members made a good showing compared with others participating in the egg-laying contests, but each successive year finds the average number of eggs per pen higher than the previous year. Thus in 1919 the pens owned by club members in the Charlottetown Egg-Laying Contest averaged 1,177 eggs. The following year at Nappan the average was 1,415, while at Fredericton in 1921 and 1922 the averages were 1,589 and 1,617 eggs respectively. It should be again pointed out that the average for the Charlottetown contest is for eleven months only while the other three contests were for a full yearly period.

A great improvement in poultry houses can be noted in districts where clubs have been located. Many new and up-to-date ones have been built, and many of the existing ones have received much needed repairs or alterations.

These results have been obtained in a province where lumbering and fishing rank high as important industries and where farms are scattered so as to make club work more difficult than in more intensive farming districts. Results should be proportionally greater under more favourable conditions.

So far I have mentioned mainly the material benefit to the province or the poultry industry generally. Greater than this is the benefit that comes to the club members and to the communities in which the clubs are located.

Individually, members have been led to observe more closely; they have been taught to recognize the good and bad qualities in the birds they have grown. They have learned something of the value of labour, the cost of production and the keeping of simple accounts. They have been supplied with up-to-date pamphlets and bulletins dealing with poultry topics, have been encouraged to read good literature and have been put in touch with some of the best agricultural publications. Their views have been broadened and their power of initiative has been developed. Collectively tney have learned the value of organized effort and of co-operation. The social instinct has been developed—a matter of importance in outlying districts.

The influence on the community at large, the parents as well as the children, has been wholesome. It often happens that the farmer may be reached through his children where otherwise it would be impossible to give him assistance.

Improvement in one line leads to improvement in another, and thus the work has a far-reaching effect in community betterment. Although poultry club work in New Brunswick has had its discouraging features at times, in the end results have been most gratifying, and the clubs, though somewhat crude in their organization, are accomplishing much good and are worthy of encouragement.

SHORT COURSES IN SASKATCHEWAN

Poultry Course

A VERY successful poultry course of two weeks' duration was concluded at the Saskatchewan College of Agriculture on February, 1923. This was one of the extension courses, and was conducted by the poultry department under the direction of Professor R. K. Baker. Eighteen students attended, and they expressed themselves as very satisfied with the course.

Professor Baker dealt largely with selection for egg production and contributory subjects, and also covered such matters as housing and feeding. Mr. T. Hampson, also of the poultry department, gave demonstrations in killing, plucking and dressing poultry, and assisted with other laboratory work. Outside assistance was contributed by M. C. Herner, Professor of Poultry Husbandry at the Manitoba Agricultural College, who gave instruction in judging exhibition birds, and by W. H. Boyle, President of the Saskatchewan Provincial Poultry Association, who demonstrated candling methods and also gave an address on matters relating to shipping.

Very particular interest was displayed in selection methods, and it is felt that a more comprehensive and convenient course should be offered in 1924 in order to satisfy the desire for more training on the part of many poultry raisers. There are many indications that interest in poultry in Saskatchewan is rapidly increasing.

Threshing Machine Course

Exceptional success attended the innovation, by the Saskatchewan College of Agriculture, of a short course in January, 1923, in the adjustment, operation, care and repair of threshing machines. This was put on as one of the extension courses and conducted by the Agricultural Engineering Department. It being an entirely new course, the attendance was a rather doubtful quantity, but it became very evident shortly after its announcement that the course would be exceptionally popular. The total enrolment was 103 students, composed largely of actual threshing machine owners.

Instruction was given in the following: Power and Speed; Pulleys, Belts and Belt Lacings; Babbiting; Cylinders and Concaves; Journals and Boxings; Feeders and Feeding; Cleaning the Grain; and Setting the Machine and Belt Alignment. The course was very practical, each student receiving practice in babbiting, lacing belts and machine adjustment. A lecture on Weed Control was also contributed by the Field Husbandry Department.

With more attention given to proper threshing machine adjustment and operation, a considerable saving of grain could be effected each year. It should also add greatly to the life of the threshing machine and at the same time lessen the cost of its operation. The unqualified success of this first course constitutes a mandate that similar instruction be provided for threshermen again next winter.

Gas Engine Courses

Two courses on Internal Combustion Engines were offered at the College of Agriculture, each being of about three weeks' duration. The January course enrolled 71 students and the February course, 55. Although similar courses have been held annually for a number of years, they continue to be very popular. Thorough instruction is given in the principles and operation of internal combustion engines.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

ECONOMICS OF IRRIGATION PRACTICE

The Second of a Series of Three Articles by W. H. Snelson, Senior Irrigation Specialist, Irrigation Branch, Dominion Reclamation Service, Department of the Interior

Irrigation Investigations

IRRIGATION investigations to determine the water requirements of crops, the most economical methods of applying water, and the crop rotations suitable for maintaining soil fertility have been conducted in Southern Alberta by the Irrigation Branch of the Dominion Reclamation Service since 1913. As a result of these investigations considerable data are now available bearing on the economics of irrigation practice. Many of the settlers of the more recently constructed irrigation projects are now confronted with the problem of making an irrigated farm pay, and the necessity of practising more intensive farming methods. It has been considered advisable by the Irrigation Branch to provide these settlers with such information, gained from direct observations at the irrigation experiment stations, as will be of assistance to them in choosing suitable crop rotations and in so preparing and irrigating their land as to ensure the maximum possible crop returns per acre with the least possible cost for water and labour.

High Cost of Inexperience

Ignorance of economical irrigation methods is costly. It needs but a brief trip through almost any of the new irrigation projects to convince one of the need of work to be done along educational lines by means of lectures, irrigation demonstrations, and irrigation experiment stations. In spite of the fact that they already have a heavy burden to bear as payments on principal, interest and maintenance, farmers will be found who are unnecessarily increasing that burden by applying, in some cases, twice the quantity of water that the soil can hold to advantage and thereby not only doubling the water cost per acre but at the same time wasting valuable plant foods by leaching them out of the soil through percolation

Inexperienced irrigators increase the cost of the crop grown by using too small an irrigating head and inadequate ditches—taking probably ten hours to irrigate an area of land that could be irrigated in one-half that time by proper methods.

Far too many farms will be seen in these new districts where no provision has been made for the maintenance of the fertility of the soil and on which the cost of growing a bushel of grain in sometimes double what it should be for water application only.

The above conditions are regrettable and should be ameliorated as soon as possible by educational work along the lines heretofore mentioned. They may, to a great extent be elim-

inated as much reliable information bearing on irrigation farming and related enterprises has been obtained by careful research work and is now available.

Economic Factors

In any study of the factors having a direct influence on the success or failure of the irrigated farm, three stand out pre-eminently: 1—the conveyance and application of water to the land; 2—the maintenance of soil fertility; and, 3—the cost of labour

Water Economy

As the basis for a proper appreciation of the factors appurtenant to water economy it is well to consider that each and every acre-foot of water received by the irrigator at his main headgate and conveyed by field laterals to his crops costs a certain sum of money; where the land irrigated is served by a pumping unit and the water is sold at a fixed price per acre-foot, the cost will be more readily appreciated perhaps than where the water is sold to the irrigator at a flat rate per acre per annum whether it is used or not. Under any system of charges, however, there is always the cost of irrigator's wages per acre-foot applied, the cost of replacing plant foods leached from the soil by over-irrigation, and the cost of the construction and maintenance of field laterals.

Water economy means then that no more water be applied to a crop than can be retained within the feeding zone of the plant roots and used to advantage by the crop; that percolation and evaporation losses be reduced to a minimum by properly constructed field laterals and well levelled land; and that water requirements per unit of yield be decreased by maintaining the fertility of the soil.

1. Losses in Transit:

Where field laterals are run on too flat a gradient, considerable losses of head occur by percolation; where laterals are too small, the irrigator is forced to work with an inadequate head of water, and finds it difficult to spread the water and secure a uniform irrigation. Very flat gradients favour the deposition of silt and the growth of weeds—both of which lower the carrying capacity of the ditch.

2 Losses in Application:

Avoidable water losses in application occur in two ways—by deep percolation and by surface waste, and are caused by: (*a*) lack of proper preparation of the land; (*b*) ditches spaced too far apart considering the irrigating head available, the texture of the soil, and the slope and surface preparation of the land, and (*c*) too frequent or too large applications of water

Economical irrigation consists in applying to a crop sufficient water to raise the moisture content of the soil occupied by the feeding plant roots to the optimum percentage for growth, with the least possible loss from deep percolation. In general practice this will require the application of an irrigation of from four to six inches in depth.

To apply light irrigations requires that the water be quickly and uniformly spread over the surface of the land, and this in turn requires that the land be well levelled and floated, with all knolls cut off and all depressions filled, and that the ditches be spaced close enough together to permit of a quick and even spread of water with the irrigating head available. Where the land has not been properly levelled, the irrigator, in his efforts to place water on the high spots will unavoidably over-irrigate the low spots, thus drowning out the crop in the depressions and losing water by deep percolation.

On poorly prepared land, the irrigator can rarely use an irrigating head in excess of two or three second-feet and will lose much of that by surface waste, whereas on well prepared land, and especially under the border system of irrigation, heads as high as fifteen second-feet can be used to advantage.

On well graded land of gentle slope ditches should be spaced not over sixty feet apart if an irrigating head of one second-foot is used, one hundred feet apart if a head of from two to three second-feet is used and one hundred and fifty feet apart if a head of from three to five second-feet is used. In general, these distances may be increased fifty per cent where the soil is heavy and impervious or where the land is in well established alfalfa or grass meadows, and should be decreased for open sandy soils.

Irrigation investigations carried on for five years at the Dominion Irrigation Experiment Station at Brooks, Alberta, have produced reliable data showing:--

1. That wheat, oats and barley require about twenty-one inches of water to produce their maximum yields per acre.

2. That this amount of water is most economically applied in light applications of from four to six inches in depth each.

3. That in years when the precipitation was only five inches during the growing season, maximum yields were produced where the sixteen inches of water, needed as irrigation to make up the amount required to mature the crop, was applied in four irrigations of four inches depth each—the first irrigation being applied the last week in May and the next three irrigations being spaced about fifteen days apart.

Three-year old Tree Plantation at Brooks Irrigation Experimental Station

These same investigations have demonstrated that a given quantity of water, if applied to grains in four-inch irrigations, would produce a

greater yield per acre than if applied in six-inch or irrigations of greater depth. The lighter irrigation was sufficient to supply the moisture deficiency within the zone occupied by the grain roots; when irrigations in excess of four inches were applied, that excess could not be retained in root zone and was lost to the crop by percolation.

Deep percolation losses, due to excessive depths per irrigation, will amount to a very large portion of the losses occurring on an irrigated farm, and cause a direct loss to the irrigator, not only because payment must be made for the application of quantities of water to the land that cannot be retained for use, but also because this excessive percolation not only leaches valuable plant foods from the root zone, but by raising the general level of the ground-water, contributes to the rise of injurious alkalies on lower lying lands.

In summarizing the factors that make for economy in the conveyance and application of water the following are of the utmost importance:

1. The land must be well graded and smoothed.

2. Ditches must be large, well built, laid on a proper gradient and kept free from weeds and silt.

3. The ditches should be so spaced as to permit of a quick and uniform irrigation with the irrigating head available.

4. The proper quantity of water should be applied at such times and in such amounts as will ensure maximum yields and prevent percolation losses.

Effect of Depth per Irrigation on Labour Cost

Studies of the water holding capacities of typical southern Alberta soils and of the depths to which grain crops penetrate and utilize the moisture have shown that it is rarely possible for an irrigation in excess of six inches in depth to be entirely retained in the zone of soil occupied by the plant roots and utilized by the crop. Experiments on the irrigation of grains have demonstrated that a given quantity of water, if applied in four-inch irrigations, will usually produce a greater yield per acre than if applied in six-inch irrigations. On the sandy soil of the Strathmore experiment station the soil will not hold more than a four-inch irrigation, therefore, if an irrigator applies, say, an eight-inch irrigation to soil of this nature, it is costing him double what it should for the labour of applying the water as the extra four inches are lost to the crop by percolation.

When a farmer is irrigating with an average head of about two cubic-feet per second, the labour cost of spreading that water is about 17½ cents per acre-inch. In a ten-hour run the stream will have delivered twenty acre-inches of water at a cost for irrigator's time of $3.50. If the land is given a four-inch irrigation, the irrigator will be able to cover five acres at a cost of 70 cents per acre; if the land is given a six-inch irrigation, only three and one-third acres will be covered and the cost per acre for irrigator's labour will be $1.05 per acre.

Effect of Correct Ditch Spacing on Labour Cost

Where the distance between ditches is too great a high percolation loss occurs. The land does not receive an irrigation of uniform depth and the cost per irrigation is increased by the amount of water lost by percolation near the supply ditch before the farther lying portions of the land or border have received an adequate amount. Where four-inch irrigations could be applied with ditches 100 feet apart, it would require six-inch irrigations to uniformly cover the land if the same head of water were used with ditches 150 feet apart.

Effect of Preparation of Land on Labour Cost

Where the land has been well prepared, light irrigations are possible. Where poorly prepared, much water is lost by surface waste. In extreme cases on rough rolling land as high as fifty per cent of the water supplied will be lost by percolation and surface waste, thus doubling the cost of irrigator's labour per acre.

The same man, who only irrigates three or four acres per day on rough land or on unfloated breaking, can irrigate as high as ten or fifteen acres per day where the land has been properly prepared for irrigation.

THE CARTER MEDAL AWARDED

MR. W. T. MACOUN, Dominion Horticulturist, was selected by the special committee of the Canadian Horticultural Council as the first recipient of the Carter Medal for outstanding service in connection with Horticulture.

The presentation was made by the donor, Mr. J. E. Carter, of Guelph, Ontario, on the occasion of a dinner held in connection with the annual meeting of the Horticultural Council at Ottawa in March last. Those in attendance included the Dominion Minister of Agriculture, the Hon. W. R. Motherwell, the Deputy Minister, Dr. J. H. Grisdale, the members of the Council's Executive, and also representatives of the Ottawa Horticultural Society and of the Ottawa Vegetable Growers' Association. Mr. Carter intimated that a fund had been established which would provide for an annual medal in perpetuity. The medal would be awarded each year, to the individual selected by the Council, for services in advancing horticulture in Canada.

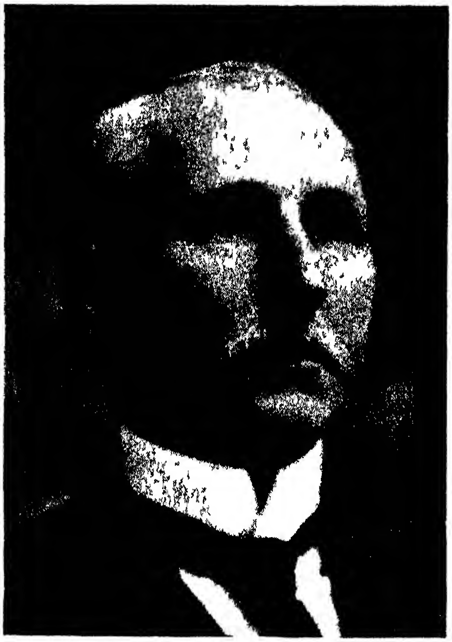
In an appropriate expression of thanks, Mr. Macoun made the statement that as a recognition of horticultural achievement, the awarding of the Carter Medal would do much to inspire effort and thus contribute to advancement in the field of horticulture.

The following statement sets forth Mr. Macoun's activities:—

Mr. W. T. Macoun, Dominion Horticulturist, entered the Government service in 1888, or about 35 years ago. For the first ten years he assisted the late Dr. Wm. Saunders, then Director of Experimental Farms, in horticultural work and in experiments with cereals. In 1908 he was appointed Horticulturist to the Central Experimental Farm, Ottawa, and Curator of the Arboretum and Botanic Garden there, in which position he remained until 1910, when he was made Dominion Horticulturist, and his duties were broadened to include the oversight of the horticultural work of the whole of the Experimental Farm System.

During his term of office Mr. Macoun has written many valuable and exhaustive bulletins including "The Apple in Canada, and Its Cultivation"; "Plum Culture"; "Bush Fruit Culture"; "Strawberry Culture"; "Potato Culture"; "Hardy Roses in Canada"; "A list of the trees and shrubs tested in the Arboretum with notes on their Hardiness"; "List of Herbaceous Perennials tested in the Botanic Garden with descriptions of flowers and dates of blooming"; and many minor pamphlets and circulars on special crops. These, in addition to his annual reports and addresses given before many meetings in different parts of Canada, have been of much aid in the advancement of horticulture in the Dominion.

During the war, Mr. Macoun was particularly active in promoting the growing of vegetables on vacant lots and in home gardens and in issuing special pamphlets to aid in this work.



Mr W. T. Macoun, Dominion Horticulturist, First recipient of The Carter Medal

Through his efforts, household canning was much encouraged during the war; the best methods of canning and preserving fruits and vegetables were demonstrated, and a bulletin on this subject based on experimental work done at Ottawa was distributed throughout Canada.

While many experiments with fruits, vegetables, and ornamental plants have been conducted at the Experimental Farm, Ottawa, under Mr. Macoun's direction, his special personal attention has been given to the breeding of fruits. Beginning

this work with the late Dr. Wm. Saunders over thirty years ago, he has continuously sought to improve on existing varieties, and many very promising new sorts, especially of apples, have resulted from his efforts. These include the Melba, Joyce, and Lobo varieties of apples. He also continued the work begun by Dr. Saunders many years ago in breeding apples especially suited for the prairie provinces, and at the Experimental Station, Morden, Manitoba, the best collection of hardy apples in America has been brought together by him.

The work of improvement is not, however, confined to fruits for, under his direction, his assistants are engaged in the breeding of vegetables and flowers of various kinds. As chairman of the Committee of Registration of the Canadian Horticultural Council, he has helped to prepare a workable scheme of registration, and the final judgment of the merits of plants proposed for registration has been left to the Dominion Horticulturist.

It is of interest to note that Mr. Macoun was intimately associated with the early history of the famous Marquis wheat. From 1892 to 1898, as Assistant to the Director of the Experimental Farms, Mr. Macoun had full charge of the new wheats produced at the Farms. It was at the commencement of this period that Marquis wheat had its beginning. While many crosses made at that time were subsequently discarded, the promising properties of Marquis were discerned by him and the variety was saved for further study.

PRINCIPAL OFFICES HELD AND BEING HELD BY W. T. MACOUN, DOMINION HORTICULTURIST

American Pomological Society: Vice President 1915-1923.

American Society for Horticultural Science: President 1912; Vice President 1910, 1917, 1918; Member of the Executive 1913, 1914, 1917.

Potato Association of America: Vice President 1917-1919.

Great Plains Section of American Society for Horticultural Science: President 1922.

Ontario Fruit Growers' Association: Director, District No. 1, 1919-1923.

Quebec Pomological Society: Life Member (Honourary) 1907.

Nova Scotia Fruit Growers' Association: Honourary Member 1899-1923.

Ottawa Field Naturalists' Club: President 1903-5; Council, 1897, almost continuously to 1923.

Ottawa Horticultural Society: President 1899; Ex Officio Member of Board of Directors 1905-1923.

Royal Horticultural Society: Member 1909-1923.

American Association for the Advancement of Science: Member 1918-1923.

Canadian Society of Technical Agriculturists: Member 1920-1923.

Ottawa Improvement Commission: Commissioner 1920-1923.

Canadian Horticultural Council: Chairman Registration Committee 1922-1923.

DAIRY PRODUCE GRADING

Summary of Regulations Governing the Export of Cheese and Butter

THE regulations adopted under The Dairy Produce Act, in effect April 1, 1923, provide that all creamery butter and factory cheese of Canadian origin shall be graded, before being exported, at such time and place as may be decided upon by the Dairy and Cold Storage Commissioner or by the Chief Dairy Produce Grader. Due consideration must be given to the convenience of the manufacturer and exporter, and the usual course of trading is to be interfered with as little as possible. All packages containing butter and cheese are to be marked at the factory in the following manner: Every churning is to be given a number, and this number is to be marked plainly and legibly on the side of each package containing butter. Every vat or batch of cheese is to be given a number and said number is to be marked in a similar way on all the cheese from the vat or in the batch and on all boxes containing the cheese. The numbering must be done consecutively in each case, starting from No. 1 throughout the shipment, whether of butter or cheese. The grader is to select one cheese from each vat and one package of butter from each churning in every shipment and grade the selections in one lot In case the shipment differs widely in quality as between different vats or churnings, the shipment may be divided into different lots of different grades

In grading factory cheese, the Dairy Produce Graders are to be governed by the following standards and points: flavour 45 points; texture 25 point closeness 15 points; colour 10 points finish 5 points. The grades are: "Special Grade," for which the total score is 94 and over and the minimum score for flavour is 41; "First Grade," or finest cheese, total score 92 and under 94, minimum score for flavour, 39; "Second Grade," or fine cheese. total score 87 and under 92, minimum score for flavour 37; "Third Grade" cheese, total score under 87, score for flavour under 37.

The standards for butter are: flavour 45 points; texture 15 points; incorporation of moisture 10 points; colour 10 points; salting 10 points; packing 10 points. The grades are the same as for cheese, and the allowance in points for each of the four grades is the same as for cheese, but "Special Grade" butter must be made from properly pasteurized cream, showing no reaction by Storch test

The grader is to issue a certificate signed by himself for each lot of cheese or butter, giving all the particulars, with special information as regards colour of both commodities and as to the percentage of salt in the butter. Pasteurized butter will be so endorsed. The owner of the butter or cheese is required to arrange a suitable place for inspection, and to open all boxes or packages. If the marking is omitted, or there is any irregularity in the marking, the grader may examine the shipments and impose a fine of five cents for each package. No cheese or butter will be examined unless it indicates the factory where it was made. No cheese will be graded until it is sufficiently mature to permit of the quality being determined. A grader may refuse to grade any butter or cheese not of temperature to permit proper examination. No package may be changed or marked in any manner inconsistent with the official stamping after grading has been done. If the regulations have not been complied with, the grader may hold any lot of butter or cheese until they have been met

CONFERENCE OF EXPERIMENTAL FARM SUPERINTENDENTS

THE holding of this conference, the first since 1915, was approved by the Honourable the Minister of Agriculture early in January, and an invitation was immediately sent to the Superintendents of the Branch Farms and Stations to be present at Ottawa on February 6-10 inclusive, 1923.

The Superintendents reporting for the Conference were as follows: Charlottetown Experimental Station, J. A. Clark; Kentville Experimental Station, W. S. Blair; Nappan Experimental Farm, W. W. Baird; Fredericton Experimental Station, C. F. Bailey; Ste. Anne de la Pocatière Experimental Station, J. A. Ste. Marie; Lennoxville Experimental Station, J. A. McClary; La Ferme Experimental Station, P. Fortier; Kapuskasing Experimental Station, S. Ballantyne; Brandon Experimental Farm, W. C. McKillican; Indian Head Experimental Farm, N. D. MacKenzie; Rosthern Experimental Station, W. A. Munro; Scott Experimental Station, M. J. Tinline; Lethbridge Experimental Station, W. H. Fairfield; Lacombe Experimental Station, F. H. Reed; Summerland Experimental Station, R. H. Helmer; Invermere Experimental Station, R. H. Newton; Agassiz Experimental Farm, W. H. Hicks; Sidney Experimental Station, E. M. Straight; and Experimental Sub-station, Beaverlodge, Alberta, W. D. Albright; Tobacco Station, Farnham, J. E. Montreuil; Tobacco Station, Harrow, D. D. Digges.

Dr. G. A. Langelier, Superintendent at Cap Rouge, Que., and Mr. W. R. Leslie, Superintendent at Morden, Man., were unable to be present on account of illness.

The programme of the conference was so arranged as to give opportunity for the discussion of all lines of experimental work with the officers in charge of those divisions of the work at Ottawa, and, in addition, general meetings were held for the discussion of wider phases of administration and policy.

On the evening of February 8, the Deputy Minister and the Director held a reception at the residence of the former on the Central Farm, thus giving the Superintendents an opportunity of meeting the entire staff of the Central Farm and the heads of the other branches of the department.

The Superintendents presented a resolution of thanks to the Minister, the Deputy Minister, and the Director of Experimental Farms for having called the conference.

ASSISTED IMPORTATION OF RAMS AND BOARS

BREEDERS of purebred sheep and swine have for some time realized the need of imported blood to supplement foundation stock in the Dominion. At the request of Breeders' Associations, a plan has been worked out whereby the Live Stock Branch of the Dominion Department of Agriculture and the various Provincial Departments of Agriculture will defray all purchasing and transportation costs in connection with the importation of rams and boars from Great Britain, thus permitting Canadian breeders to secure the best of British stocks at the actual cost in that country.

In sheep, this assistance will be expended to those breeds that are recognized as of special commercial value in the production of choice quality market lambs, and at the same time produce wool of the better marketable grades. Assistance for boars will be confined entirely to the recognized bacon breeds.

SCHOLARSHIPS IN AGRICULTURE

IN order to encourage post-graduate study, the firm of W. C. Macdonald Registered, through its President, Mr. Walter M. Stewart, has offered one scholarship to each of the provinces, open to agricultural graduates, tenable for one year at Macdonald College, and valued at $500 for the scholastic year.

The scholarships for British Columbia, Alberta and Saskatchewan are offered to agricultural graduates of the faculty of agriculture of the respective universities. Failing such, to any graduate in agriculture resident in each of these provinces. In Manitoba, the scholarship is offered to a graduate of the Manitoba Agricultural College. In Ontario, to a graduate of the Ontario Agricultural College. In Quebec, two scholarships are offered: One to a graduate of the Agricultural Institute of Oka (University of Montreal), and one to a graduate of the Agricultural School at Ste. Anne de la Pocatière (Laval University). In the Maritime Provinces, scholarships are awarded through the respective Secretaries or Ministers of Agriculture to agricultural graduates resident in the provinces, preference being given to men who have had two years' training at the Truro Agricultural College and two years at some other agricultural college. Failing such candidates, they are open to any agricultural graduate resident in each province.

If these scholarships are not filled by the respective provinces by the first of July, they are left at the disposal of the Principal of Macdonald College.

NEWS ITEMS AND NOTES

The first shipment of Canadian store cattle for the British market since the removal of the embargo was personally inspected at Montreal by the Dominion Minister of Agriculture, Hon. W. R. Motherwell, the Deputy Minister, Dr. J. H. Grisdale, and other officers of the Department of Agriculture, as well as by several Members of Parliament. There were 427 animals in the shipment, mostly of the Shorthorn and Polled Angus types, and of good beef quality. The Minister stated his belief that the resumption, after a period of 30 years, of store cattle shipments would lead to the gradual development of an important export trade.

The gift to Canada of five breeding Shire horses, two stallions and three mares, by the Shire Horse Society of Great Britain, has been added to by Mrs. Stanton, of Derbyshire, England, who has contributed a two-year-old colt from her famous stud at Snelston, near Ashbourne.

This colt is the son of one of the best bred mares in the Empire, and by a very famous sire—one time champion of the breed in the British Isles.

Mr. Arthur Gibson, Dominion Entomologist, and Mr. H. T. Güssow, Dominion Botanist, have been authorized to attend an important international conference on economic entomology and phytopathology, which has been called by the Dutch Government to take place at Wageningen, Holland, June 25 to 30.

It is expected that delegates from various countries will be present to discuss matters relating to international laws, control of insects and diseases, etc.

While in England and on the continent Messrs. Gibson and Güssow will visit various entomological and pathological stations and also a number of the larger nurseries.

Hitherto eggs imported into Canada in less than ten case lots have not been subjected to inspection, and by making small consignments, shippers were able to evade the regulations. The regulations have now been amended, and all shipments of eggs in the shell will henceforth be subject to inspection and marking at the port of entry.

The Minister of Agriculture, Hon. W. R. Motherwell, announces that the Dominion Government Seed Purchasing Commission will cease to function in the purchasing and distribution of seed grain. The Seed Purchasing Commission was organized under the Dominion Seed Branch in 1916 for the purpose of supplying seed grain at approximate cost to farmers in localities having a complete or partial crop failure. The development of the seed grain trade has since made steady progress, and the proportion of the requirements handled by the Commission has decreased correspondingly from year to year since 1919.

The Seed Purchasing Commission functioned for six years without cost to the country, and prevented, during that period, a seed shortage in any part of Canada.

For the six months ending February 28, 1923, Canadian wheat exported to the United Kingdom amounted to 130,244,830 bushels, compared with 75,057,650 bushels during the same six months of 1921-22. Wheat exported to the United States during the six months amounted to 9,615,909 bushels, compared with 9,413,971 bushels for the same period of 1921-22. Canada's total wheat exports for the six months totalled 159,680,596 bushels, as against 103,727,326 bushels exported during the same period a year ago.

The total wheat flour exported during the six months was 6,034,499 barrels, value $33,818,380, as compared with 3,920,520 barrels during the six months ending February 28, 1922.

The dairy industry in the Argentine has shown constant and remarkably rapid growth in recent years. In 1910 the production of butter was 16,617,000 pounds, and of cheese, 6,045,000 pounds. By 1921 butter production had increased to 72,294,000 pounds and cheese production to 52,265,000 pounds.

This expansion of the Argentine dairy industry is making available on the English markets large quantities of Argentine butter in competition with that from other exporting countries. It is also placing large quantities of cheese on American markets.

The average value of the occupied farm lands of Canada, which includes both improved and unimproved land, together with dwelling houses, barns, stables and other farm buildings, is returned as $44 per acre, as compared with $40 in 1921, $48 in 1920, $46 in 1919, $41 in 1918, $38 in 1917, $36 in 1916 and $35 in 1915. By provinces, the value for 1922 is highest in British Columbia, viz., $120. In the other provinces the average values of farm lands per acre are reported as follows: Ontario $64; Quebec $58; Prince Edward Island $45; Nova Scotia $34; New Brunswick and Manitoba $32; Saskatchewan $28 and Alberta $24.

The average values in 1922 of orchards and fruit lands, including buildings, etc., in the fruit growing districts of Nova Scotia, Ontario and British Columbia are estimated as follows: Nova Scotia $93 ($117); Ontario $127 ($137); British Columbia $320 ($300).

During the fiscal year ending March 31, 1923, the number of books borrowed from the Library, International Institute Branch, Dominion Department of Agriculture, was 5,029. The number of persons availing themselves of the privilege of borrowing was 581, including Federal departmental officials, and those connected with agricultural extension, teaching and research in each of the provinces of the Dominion.

As an outcome of breeding work by the department of field husbandry of the University of Alberta, a new wheat has been produced for the limited rainfall areas. Professor G. H. Cutler states that this wheat, as shown by an average of three years' tests, is five inches taller than Marquis and three days later in maturing. Its milling and baking qualities are the equal of Marquis, based on tests conducted by two independent research laboratories in Winnipeg. For the same three years' trials in competition with Marquis and Red Fife, it has outyielded both of those varieties by a little better than nine bushels per acre.

The wheat gives promise of fulfilling the purposes for which it was bred, namely: (1) to give greater length of straw in limited rainfall areas, where in dry years straw is so short as to make harvesting difficult, (2) to offset decrease in yield due to reduction of soil fertility, and (3) to reduce production cost through increased yield. Seed is not yet available for distribution.

An agricultural school is to be provided at Fredricton, New Brunswick, from the grant allotted to that province for agricultural instruction. The school is to be located at the Dominion Experimental Farm, Fredricton. Construction will be proceeded with at once so that the building may be ready for use in the autumn, when the first courses will be given.

Demonstration or "Better Farming" trains have been a notable feature of the work of extension in Saskatchewan, where they have been operated regularly, with one exception, since 1914. These trains, staffed by experts and equipped with exhibits, have been termed "A College on Wheels." The departments of dairying, live stock, field husbandry and household science are featured. Recently carloads of breeding animals for sale or exchange have been carried with the object of improving the herds and flocks. The train makes stops at scheduled points on the lines of railway and is visited by the people of the vicinity, whose problems are dealt with. In Saskatchewan the number of persons reached each season has averaged over 3,000. In Quebec, Alberta and other provinces similar trains have been operated from time to time.

The Dominion and Provincial Departments of Agriculture, in co-operation with the breeders' associations, operated a Better Live Stock Special Train in the Province of Ontario during March and April. The train comprised sixteen cars, including cattle, sheep, swine and poultry. In cattle, the value of the pure bred sire to the beef industry was illustrated, as well as the best type of steers for the British and domestic markets. Typical hogs of different types were carried, also an exhibit of sheep and a display of grades of wool. Addresses on farm topics were given in the lecture car at each stopping place.

Two Livestock Improvement trains were operated during May in the Province of Manitoba under the joint auspices of the Dominion and Provincial Departments of Agriculture and the breeders' associations. The railway companies furnished the trains free of charge. Manitoba-bred bulls of the leading breeds were carried. Every bull was tuberculin tested, and representatives of the breeders accompanied the trains and made the sales. Assistance was extended to purchasers in the form of loan not exceeding one-half of the price of the animal. Bulls were accepted in exchange as part payment. The train was equipped for lectures, motion pictures, demonstrations of types of animals, and other educational features. The lectures included separate programmes for men and women, boys and girls.

In many of the provinces, the Agricultural Instruction Act has been of great assistance to the dairy industry. In Nova Scotia the grant led to the establishment of a division of dairying, and butter factory output was increased from 200,000 pounds in 1912 to over 3,000,000 pounds in 1921.

In Saskatchewan and other western provinces instruction was given in the better breeding and feeding of dairy herds, in the care of milk and cream on the farm, and in the means and methods of marketing. A notable increase has taken place of recent years in the creamery output of those provinces.

In British Columbia cow-testing was featured. In Quebec and in the Maritime Provinces dairy schools were assisted, while the makers of butter and cheese were instructed and assisted through the system of inspection.

The Quebec Department of Agriculture (Bureau of Statistics Branch) has issued a preliminary statement showing the production and value of butter and cheese in that province during 1922, as follows:—Butter, 52,529,344 lbs., valued at $18,110,304; cheese, 39,679,901 lbs., valued at $6,307,581.

The output of the 59 creameries in Saskatchewan was 8,901,104 pounds of creamery butter during the year 1922. That winter dairying is becoming more popular in that province is evidenced by the fact that during November, December and January 1921-22 there were 672,409 pounds of butter manufactured, while during the same months in 1922-23 the creamery output was 1,204,034 pounds, or an increase of 79 per cent.

What milk is doing to build the school children of the nation into strong and healthy citizens, prepared to carry on the arts of peace, will be one of the important subjects discussed at the World's Dairy Congress, which is to be held in the United States next October. President Harding has invited all governments to send official representatives to the meeting and everyone interested in the production, manufacture, distribution and use of milk will be welcome. Many of the world's best known scientists will speak. The proceedings will be conducted in English, French, German and Spanish. Full information may be secured from the World's Dairy Congress Association, 426 Star Building, Washington, D.C., U.S.A.

The 1923 Wool Letter, issued by the Canadian Co-operative Wool Growers, Ltd., states, "The wool statistical position of to-day is strong; stocks are reduced, world consumption is ahead of production, and the demand now covers all grades."

The Hon. Manning Doherty, Minister of Agriculture for Ontario, recently instituted a Horticultural Board whose duty it will be to co-ordinate the work of the horticultural department of the Ontario Agricultural College, the Vineland Station, and the Kemptville and Fort William branches, in order to have their experiments free from overlapping, and their various lines of endeavour directed to some definite end.

The Board consists of the President of the Ontario Agricultural College, the Professor of Horticulture, the Director of the Fruit Branch, the Director of the Vineland Experiment Station, and the Secretary of the Agricultural Department.

The Board will recommend that all students of Horticulture shall in future spend at least one summer of their course at the Fruit Station at Vineland.

One of the weaknesses of our agricultural life is that at the business end of farming there is a lack of co-operation both in production and in marketing. Conditions to-day, however, are greatly improved over what they were ten years ago. This improvement is largely attributable to the aid given by the Agricultural Instruction grant to propaganda work through agricultural societies, producers' conventions, agricultural representatives, and similar means. In two of the provinces, Ontario and Saskatchewan, the grant led to the creation of a Branch to give information on co-operative organizations and the extension of markets. In other provinces educational effort has been applied to the marketing of live stock, poultry and eggs, wool, etc. Demonstrations in the marketing of wool were so successful as to lead to the adoption of this method by the Canadian Co-operative Wool Growers, an organization of producers operating throughout the Dominion.

With the object of providing an authentic and regular source of market information for the farmers in Ontario, the Provincial Minister of Agriculture, the Hon. Manning Doherty, announces that arrangements have been made whereby a cable letter is being received twice weekly from England and given to the press for publication. The letter quotes prevailing prices for such products as cheese, butter, bacon, condensed milk, tobacco, fruits, fresh and canned, cattle and eggs. In addition to prices, the general market conditions and outlook in Great Britain are set forth.

The special courses in Dairying, held at the Ontario Agricultural College in March, were attended by 123 students.

The outstanding feature in connection with the courses was the large demand for men to go into factories, city milk plants, and the Civil Service as graders. One of the Western Provinces asked for 45 men to act as cream graders. This indicates the strong position grading holds among Western Canada creamerymen.

The registration in the various courses was as follows:—Factory Class, 42; Farm Dairy, 7; Cow-testing, 12; Ice-cream and Soft Cheese, 16; Butter and Cheesemakers, 38; Specialists, 8.

G. H. Cutler, Professor of Field Husbandry of the University of Alberta, was recently elected a Fellow of the Royal Meteorological Society of London, England. Professor Cutler has been engaged in Agronomic research in the West for the past ten years, and has for several years, been accumulating and compiling data regarding temperature and moisture conditions throughout the

Province of Alberta. This information will be of especial value in connection with land settlement, irrigation, and drought-relief schemes. It is in recognition of these and other contributions to the science of meteorology that the Society has conferred this honour.

The establishment of a system of Agricultural Representatives in local centres is looked upon as one of the very important steps that has been taken of recent years to render effective service to the farmer. The passing of the Agricultural Instruction Act gave a marked impetus to the development of this service, and although retarded by the war, the system has been extended to all the provinces in some form or other, while the older provinces are now completely organized. A considerable portion of the grant has been applied to the extension and development of this service.

Since the establishment of the county agriculturist service in the Province of Quebec, the work has grown very rapidly, until it has become impossible to properly direct it from one central head office. It has therefore been decided to divide the province into six large agricultural districts, with at the head of each a District Superintendent to supervise the work of the county agriculturists within his territory. With his comparatively small number of counties to visit he will be able to keep closely in touch with the work of each county agriculturist.

To the district superintendent's office will be attached the assistant agriculturists for the district, instead of their being attached to certain counties as at present. These assistants will be sent out to the various agriculturists as they are required. The superintendent will also have under his control a certain number of demonstrators or instructors on specialized lines of work, placed in the district by the various branches of the Department. These men will be partly responsible to the superintendent, who directs their field work, and partly responsible to the chiefs of the branches that they represent.

The School Fair and Boys' and Girls' clubs are efforts to interest boys and girls in better seed, better stock, and better methods of agricultural and housekeeping practice. They give boys and girls a new point of view as regards farming operations, and have grown in response to popular demand. The fact that they retain their hold from year to year upon both young and old is an indication of their usefulness and value.

The Boys' and Girls' Club movement in Manitoba began concurrently with the agricultural instruction grant being made available in 1914. Its development has been noteworthy, there now being 225 central clubs, 1,600 branches and over 30,000 members. During the past year 215 club fairs were held at which over 30,000 children exhibited.

The boys' and girls' demonstration team movement began in Manitoba four years ago, and was participated in last year by over 1,000 girls. The range of subjects dealt with by the teams is a wide one, including canning, dyeing, laundering, bread-making, millinery, cooking, and many others.

Previous to the time that the Agricultural Instruction Act went into effect there were only 25 school fairs in the Province of Ontario. In 1921, 442 such fairs were held in which a total of about 100,000 boys and girls participated.

In Saskatchewan, the Farm Boys' Camp, inaugurated in 1915, has proved a very successful method of being of service to farm boys, 2,500 having already been reached.

Last year, in the same Province, 62 centres organized boys' and girls' clubs, and 275 school fairs were held.

APPOINTMENTS AND STAFF CHANGES

Dr. J. M. Swaine has been appointed Associate Dominion Entomologist in place of Chief, Division of Forest Insects, and will assist the Dominion Entomologist in the general work of the Branch, particularly that pertaining to research.

Mr. Romeo Cossette, B.S.A., has been appointed Assistant Superintendent at the Dominion Experimental Tobacco Station, Farnham, Que., in the place of Mr. Armand Gelinas, resigned.

Mr. P. Stewart, B.S.A., has been elected by the executive of the Canadian Seed Growers' Association to replace Mr. L. H. Newman, who was, on February 1 of this year, promoted to the position of Dominion

Cerealist. Mr. Stewart, who was born at Wick, Scotland, came to Canada at an early age. He was prominent in the development, in its early stages, of the seed growing industry of the Rainy River district in Ontario, and experience and organizing ability are among the qualifications that fit him for the position he now occupies. On his return from overseas military service, he was appointed to a position on the staff of the Soldier Settlement Board, after which he was engaged in inspection work in connection with the Seed Branch of the Dominion Department of Agriculture. The appointment is for the balance of the Association's year.

The following persons have been appointed Dairy Produce Graders at Montreal, P.Q.: Jas. H. Henderson, formerly Dairy Promoter, Toronto; John Cuthberton, Stratford, Ont.; Geo. Thimens, Sussex, N.B.; Freeman Brown, Oxford Mills, Ont.; Frank Monahan, Valleyfield, Que.; G. A. Bourbeau, St. Hyacinthe, Que.; E. Charbonneau, St. Hyacinthe, Que.; Jas. L. Irwin, Kingston, Ont.; (for Central Ont).

ASSOCIATIONS AND SOCIETIES

Alberta Poultry Association.—President, J. H. Westbrook, Lethbridge; 1st Vice-president, Jos. Shackleton, Edmonton; 2nd Vice-president, W. A. Moore, Medicine Hat; Secretary-Treasurer, P. J. Timms, Calgary.

New Brunswick Sheep Breeders' Association.—President, W. E. Wallace; Vice-president, W. K. Allen; Secretary-Treasurer, Jas. Bremner.

Nova Scotia Fruit Growers' Association.—President, J. Elliott Smith, Wolfville; Vice-president, A. Fitzrandolph, Bridgetown; Secretary, F. W. Foster, Kingston.

Niagara Peninsula Fruit Growers' Association.—President, J. B. Fairbairn, Beamsville; Secretary-Treasurer, Carl E. Fisher, St. Catharines.

Quebec Jersey Cattle Breeders' Association.—President, F. G. Gale, Waterville; Vice-president, Chas. O. Edwards, Hillhurst; Secretary-Treasurer, R. L. Gale, Waterville.

British Columbia Goat Breeders' Association.—President, D. Mowat, McKay; Vice-president, C. H. Unwin, Victoria; Secretary-Treasurer, George Pilmer, Department of Agriculture, Victoria.

New Brunswick Farmers' and Dairymen's Association.—President, C. E. Pickett, Andover; Vice-president, H. W. Atkinson, Fredericton Jct.; Corresponding Secretary, A. J. Doucet, Notre Dame, Recording Secretary, A. J. Gaudet, St. Joseph, Westmoreland.

Canadian Standard Bred Horse Society.—Hon. President, F. S. Scott, Galt, Ont.; President, Thomas Bartram, 78 Roxborough W., Toronto; Vice-president, J. J. Burns, 393 Berkley St., Toronto; Secretary-Treasurer, Jno. W. Brant, 66 Queen St., Ottawa.

United Farmers of Alberta.—President H. W. Wood, Carstairs; Vice-president, H. E. G. H. Scholefield, Crossfield; Secretary-Treasurer, H. Higginbotham, Calgary.

Saskatchewan Grain Growers' Association.—President, J. A. Maharg; Vice-president, Geo. F. Edwards; Secretary, A. J. McPhail, Farmers Bldg., Regina, Sask.

Women's Section, Saskatchewan Grain Growers' Association.—President. Mrs. W. H. Frith, Birmingham; Vice-president, Mrs. Ida McNeal, Expanse; Secretary, Mrs. M. L. Burbank (Central Office) Regina.

British Columbia Poultrymen's Co-operative Exchange.—President, H. Ruttledge, Sardis; Vice-president, C. Raine, Surrey Centre; Secretary-Treasurer, G. C. Milnes, 1114 Hamilton St., Vancouver.

Saskatchewan Belgian Horse Breeders' Club.—President, Robert Thomas, Grandora; Vice-president, D. V. Runkle, Regina; Secretary, E. L. Hodgens, Halbrite.

Saskatchewan Percheron Breeders' Club.—President, W. B. Thompson, Milestone; Vice-president, A. McLaren, Pense; Secretary-Treasurer, L. A. Paul, Regina.

Saskatchewan Clydesdale Breeders' Club.—President, P. H. Taylor, Arcola; Vice-president, Jack Byers, Valjean; Secretary, N. D. MacKenzie, Indian Head.

Saskatchewan Hereford Breeders' Club.—W. N. Catley, Craven; Vice-president, W. S. Shore, Cupar.

Saskatchewan Shorthorn Breeders' Club.—President, R. A. Wright, Drinkwater; Vice-president, N. D. MacKenzie, Indian Head; Secretary, N. M. Ross,Indian Head.

Alberta Seed Growers' Association.—President, Major H. G. L. Strange, Fenn; Vice-president, G. M. Stewart, Dominion

Seed Branch, Calgary; Secretary-Treasurer, W. J. Stephen, Crops Commissioner, Edmonton, Alta.

Alberta Agricultural Fairs' Association.—President, Rufus Cates, Oyen; Vice-president, Harold Huxley, Lloydminster; Secretary-Treasurer, Alex. Galbraith, Edmonton.

Saskatchewan Agricultural Societies' Association.—President, N. B. Williams, Abernethy; Secretary-Treasurer, L. M. Moore, Colgate.

Manitoba Beekeepers' Association.—President, G. M. Newton; Vice-president, W. G. Stanbridge; Secretary-Treasurer, L. T. Floyd, Provincial Apiarist, Parliament Buildings, Winnipeg.

Nova Scotia Farmers' Association.—President, Rev. R. L. MacDonald, St. Peters; 1st Vice-president, A. Fitzrandolph, Bridgetown; 2nd Vice-president, P. H. Andrews, Coxheath; Secretary-Treasurer, C. R. B. Bryan, Agricultural College, Truro.

Ontario Vegetable Growers' Association.—President, W. H. Stewart, Aylmer, Que.; Vice-presidents, W. J. Cooke, Cataraqui, and Chris. Fretz, Vineland Station; Secretary-Treasurer, J. Lockie Wilson, Toronto.

Canadian Holstein Breeders' Association.—President, R. W. E. Burnaby, Jefferson; Vice-presidents, R. M. Holtby, Port Perry; Hon. W. M. Lea, Charlottetown, P.E.I.; P. J. Salley, Lachine Rapids; Cris. T. Houck, Chippawa.

Ontario Plowmens' Association.—President, George B. Little, Agincourt; 1st Vice-president, W. H. Patterson, Agincourt; 2nd Vice-president, R. H. Abraham, Chatham; Secretary, J. Lockie Wilson, Toronto.

Saskatchewan Field Husbandry Association.—Honorary President, Dean W. J. Rutherford, College of Agriculture, Saskatoon; President, E. G. Booth, Director of Co-operative Experiments, University of Saskatchewan, Saskatoon; 1st Vice-president, W. J. F. Warren, M.L.A., Belbeck; Secretary, Manley Champlin, Professor of Field Husbandry, University of Saskatchewan, Saskatoon.

Manitoba Clydesdale Breeders' Club.—President, James Burnett, Napinka; Vice-president, Freeman Rice, Binscarth.

Manitoba Shorthorn Breeders' Club.—President, E. McConnell, Hamiota; Vice-president, Freeman Rice, Binscarth ; Secretary, John Strachan, Pope.

Manitoba Hereford Breeders' Club.—President, J. A. Chapman, Hayfield; Vice-president, Frank Hyslop, Killarney; Secretary, R. W. Rutherford, Teulon.

Dominion Shorthorn Breeders' Association.—President, Harry Pettit, Freeman; Vice-president, Hon. Duncan Marshall; Second Vice-president, J. Gardhouse, Weston; Secretary-Treasurer, G. E. Day, Guelph.

Canadian Hackney Breeders' Society.—Honorary President, Robert Graham, Toronto; President, Dr. W. J. R. Fowler, Guelph; Vice-president, H. A. Mason, Scarboro'; Secretary-Treasurer, J. E. Rettie, Toronto.

British Columbia Ayrshire Breeders' Association.—President, E. A. Wells, Sardis, B.C.; Vice-president, S. Shannon, Cloverdale, B.C.; Secretary-Treasurer, H. M. King, University of British Columbia, Vancouver.

British Columbia Stockbreeders' Association.- President, Alex. Davie, Ladner; Vice-president, F. B. Ward, Douglas Lake.

Canadian Swine Breeders' Association.—President, J. E. Brethour, Burford; Vice-president, Wm. Gilbert, Stony Plain, Alta.; Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Ontario Swine Breeders' Association.—President, W. F. Wright, Glanworth; Vice-president, Russell Templar, Burford; Secretary-Treasurer, J. E. Rettie, Toronto.

Ontario Sheep Breeders' Association.—President, Jas. Bowman, Guelph; Vice-president, C. Stobbs, Wheatley; Secretary-Treasurer, L. O'Neil.

Canadian Dual-Purpose Shorthorn Breeders' Club.—President, G. L. Smith, Meadowvale; Vice-president, D. Z. Gibson, Caledonia; Secretary-Treasurer, Ross Martindale, Caledonia.

Ontario Cattle Breeders' Association.—President, John Gardhouse, Weston; Vice-president, W. E. Thompson, Woodstock; Secretary, R. W. Wade, Toronto.

Ontario Seed Growers' Association.—President, J. W. Sangster, Listowel; Vice-president, A. G. Gormley, Unionville; Secretary-Treasurer, F. C. Hart, Toronto.

Western Ontario Poultry Association.—President, T. Simpson; 1st Vice-president, R. Oke, London; 2nd Vice-president, W. J. Roberts, Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Canadian Jersey Cattle Club.—President, F. E. M. Robinson, Richmond, Que.; 1st Vice-president, Frank Silcox, Iona; 2nd Vice-president, J. M. Dolson, Brampton; Secretary-Treasurer, J. W. Wheaton, 186 King Street, W., Toronto.

Quebec Jersey Breeders' Association.—Hon. President, J. W. Norcross, Montreal; President, F. G. Gale, Grayburn Farms, Waterville; Vice-president, C. O. Edwards, Maplehurst Farm, Hillhurst, Que.; Secretary-Treasurer, R. L. Gale, Waterville.

Saskatchewan Corn Growers' Association.—Hon. President, W. R. Abbott, Maple Creek; President, David Kearns, Maple Creek; 1st Vice-president, C. R. Evans, Piapot; 2nd Vice-president, Jack Byers, Valjean; Secretary-Treasurer, C. H. Stockdale, Maple Creek.

Farmer's Union of Canada.—Directors: H. K. Webb, Kelvington; J. Shore, Lintlaw; S. Sinclair, Lipton; Secretary-Treasurer, N. H. Schwarz, Ituna.

Canadian Horticultural Council.—President, Col. H. L. Roberts, Grimsby; 1st Vice-president, F. W. Bishop, Paradise, N.S.; 2nd Vice-president, L. E. Taylor, Kelowna, B.C.; Secretary-Treasurer, L. F. Burrows, Ottawa.

Alberta Horse Breeders' Association.—Secretary, E. L. Richardson, Calgary, Alta.

Canadian Aberdeen-Angus Breeders' Association.—President, James Browne, Neudorf, Sask.; Vice-president, John Lowe, Elora, Ont.

British Columbia Honey Producers' Association.—Secretary-Treasurer, Central Executive, W. J. Sheppard, Nelson, B.C.

New Brunswick Beekeepers' Association.—President, Geo. L. Pugh, Nashwaaksis, N.B.; 1st Vice-president, C. W. Lewis, Perth, N.B.; 2nd Vice-president, C. Allen Coster, Hampton; Secretary-Treasurer, H. G. Miller, Provincial Apiarist, Fredericton.

Canadian Pony Society.—President, Dr. W. J. R. Fowler, Guelph; Vice-president, A. E. Major, Whitevale; Secretary-Treasurer, G. de W. Green, Toronto.

Canadian Shire Horse Association.—President, W. J. Gardhouse, Thistletown; Vice-president, Thos. Rawlinson, Innisfail, Alta.; Secretary-Treasurer, G. de W. Green, Toronto.

The Society at its annual meeting passed a resolution recording appreciation of the gift to the Dominion of Canada by the English Shire Horse Society of two stallions and three mares representative of the breed.

Ontario Horticultural Association.—President, J. P. Jaffray, Galt; 1st Vice-president, J. E. Carter, Guelph; 2nd Vice-president, Geo. Simpson, Ottawa; Secretary, J. Lockie Wilson, Toronto; Treasurer, C. A. Hesson, St. Catharines.

Canadian Hereford Breeders' Association.—President, Walter Redhead, Milton, Ont.; Vice-president, J. A. Chapman, Hayfield, Man.; Secretary-Treasurer, H. D. Smith, Ancaster, Ont.

Ontario Hereford Breeders' Association.—President, J. E. Harris, Kingsville; Vice-president, Wm. Mitchell, Norham; Secretary-Treasurer, A. L. Currah, Bright.

Ontario Yorkshire Breeders' Society.—President, H. A. Dorrance, Orangeville; Vice-president, D. J. Lerch, Preston; Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Ontario Berkshire Breeders' Society.—President, G. A. Dewar, Wyoming; Vice-president, G. L. Smith, Meadowvale; Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Brown Swiss Breeders' Association.—Hon. President, J. B. Spencer, Ottawa; President, W. A. Jolley, Waterloo, Que.; Vice-president, W. T. Sass, Kitchener; Secretary, R. H. Libby, Stanstead, Que.

Tamworth Breeders' Club.—President, H. German, St. George; Vice-president, G. Douglas, Mitchell; Secretary, J. Alexander, Georgetown.

Canadian Ayrshire Breeders' Association.—Hon. President, H. S. Arkell, Ottawa; President, J. L. Stansell, M.P., Straffordville, Ont.; Vice-president, Frank Byrne, Charlesbourg, Que.; Secretary, W. F. Stephen Huntingdon, Que.

Among the resolutions passed was one endorsing the proposal to establish Union Stock Yards at Montreal.

Nova Scotia Dairymen's Association.—President, John E. Falt, Antigonish; Vice-president, C. R. DeLong, New German; Secretary-Treasurer, W. A. MacKay, Truro.

Nova Scotia Poultry Association.—President, H. H. Hull, Glace Bay; Vice-president, Frank E. Jackson, North Sydney; Secretary-Treasurer, J. P. Landry, Truro.

Ontario Angus Breeders' Association.—President, J. Lowe; Secretary, Jas. Bowman, Guelph.

Ontario Milk Producers' Association.—President, E. H. Stonehouse; Vice-president, E. A. Orr; Secretary, J. P. Griffin.

Saskatchewan Live Stock Board.—President, R. A. Wright, Drinkwater; Vice-president, Robt. Sinton, Regina; Secretary, J. G. Robertson, Regina.

The presidents and vice-presidents of the undermentioned Live Stock Associations constitute the personnel of the Board, together with representatives of the Department of Agriculture and the College of Agriculture.

Horse Breeders' Association.—President, Robt. Thomas, Grandora; Vice-president, Swanton Haggerty, Regina.

Cattle Breeders' Association.—President, R. A. Wright, Drinkwater; Vice-president, W. D. Lyon, Deveron.

Sheep Breeders' Association.—President, G. N. Buffum, Bechard; Vice-president, Olaf Berg, Loreburn.

Swine Breeders' Association.—President, C. M. Learmonth, Regina; Vice-president, D. V. Runkle, Estlin.

Poultry Breeders' Association.—President, W. H. Boyle, Regina; Vice-president, S. L. A. Smith, Strasbourg.

Saskatchewan Stock Growers' Association.—President, J. Byers, Valjean; Vice-president, O. Olafson, Moose Jaw.

National Dairy Council of Canada.—President, E. H. Stonehouse, Toronto; Vice-president, F. M. Logan; Secretary, D'Arcy Scott, Central Chambers, Ottawa.

Among the resolutions passed at the annual meeting was a pronouncement in favour of the compulsory pasteurization of all milk for consumption in cities.

In order to improve the quality of Canadian cheese, it was recommended that it be made illegal to remove cheese from the place of manufacture until after the lapse of 14 days.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

The microscope in the mill, by James Scott. Liverpool, Northern publishing co. 1920. 246p. il.

Researches on fungi, Vol. II: Further investigations upon the production and liberation of spores in Hymenomycetes, by A. H. R. Buller. New York, Longmans, Green & co. 1922. 492p. il.

Outlines of evolutionary biology, by Arthur Dendy. London, Constable & co. ltd. 1921. 654p. il.

The origin and development of the Compositae, by James Small. London, William Wesley & son, 1919. 334p. il.

Forced movements, tropisms, and animal conduct, by Jacques Loeb. Philadelphia, J. B. Lippincott co. 1918. 209p. il.

Handbook of meteorology; a manual for co-operative observers and students, by Jacques W. Redway. New York, John Wiley & sons, 1921. 294p. il.

The economic resources of Italy; their development during the last twenty-five years and their present condition. Milan, "Credito Italiano," 1922. 2 volumes.

Letters of William Farrer, wheat breeder, New South Wales, Australia, 1894-1906, to Dr. B. T. Galloway and Mr. M. A. Carleton. Washington, Bureau of plant industry, 1922. 116p. tpw.

Répertoire de couleurs pour aider à la détermination des couleurs des fleurs, des feuillages et des fruits. Paris, Société française des chrysanthemistes. 182 plates.

Tobaccoland; a book about tobacco; its history, legends, literature, cultivation, social and hygienic influences, commercial development, industrial processes and governmental regulation, by C. A. Werner. New York, The tobacco leaf publishing co., n.d. 474p. il.

Mexican petroleum.. New York, Pan American petroleum & transport co. 1922. 300p. il.

Practical color photography, by E. J. Wall. Boston, American photographic publishing co. 1922. 248p. il.

Origin and history of all pharmacopeial vegetable drugs... by J. U. Lloyd. Cincinnati, 1921. 449p.

A monograph of azaleas... by E. H. Wilson and Alfred Rehder. Cambridge University press, 1921. 219p.

Veterinary studies for agricultural students, by M. H. Reynolds. 8th ed. New York, Macmillan co. 1922. 301p. il.

Hardy perennials, by A. J. Macself. New York, Charles Scribner's sons, 1922. 219p. il.

Woollen and worsted spinning, by A. F. Barker. Toronto, Cassell & co. 1922. 344p. il.

A biochemic basis for the study of problems of taxonomy, heredity, evolution, etc., with especial reference to the starches and tissues of parent-stocks and hybrid-stocks and the starches and hemoglobins of varieties, species and genera, by E. T. Reichert. Washington, Carnegie institution, 1919. 2 parts.

Plants of the Punjab; a descriptive key to the flora of the Punjab, North-west frontier province and Kashmir, by C. J. Bamber. Lahore, Government printer, 1916. 652p. il.

Fruit growing in New Zealand, by J. T. Sinclair. London, Whitcombe & Tombs, ltd. n.d. 132p. il.

The formation of colloids, by The Svedberg. New York, D. Van Nostrand co. 1921. 127p. il.

Rose gardening, by Mary Hampden. New York, Charles Scribner's sons, 1922. 231p. il.

Electricity in agriculture, by A. H. Allen. Toronto, Sir Isaac Pitman & sons, 1922. 117p. il.

Bulb gardening, by Mary Hampden. New York, Charles Scribner's sons, 1922. 221p. il.

The industrial Punjab, by A. Latifi. New York, Longmans, Green & co. 1911. 304p.

The petroleum industry, London. The institution of petroleum technologists, 1922. 346p. il.

Human life as the biologist sees it, by Vernon Kellogg. New York, Henry Holt & co. 1922. 140p.

The reptiles of Western North America, by John Van Denburgh. San Francisco, 1922. 2 volumes.

Rural Michigan, by L. A. Chase. Toronto, The Macmillan co. 1922. 492 p. il.

History of the board of trade of Chicago, edited by C. H. Taylor. Chicago, Robert O. Law Co. 1917. 3 volumes.

Tsetse-flies; their characteristics, distribution and bionomics with some account of possible methods for their control, by Major E. E. Austen, and Emile Hegh. London, The imperial bureau of entomology, 1922. 188p. il.

Australia: A commercial and industrial handbook, by A. W. Ferrin. Washington, Government printing office, 1922. 162p. il.

Bread facts, 4th ed. New York, Ward baking co. Research products department. 1922. 127p.

Studies in plant respiration and photosynthesis, by H. A. Spoehr and J. M. McGee. Washington, Carnegie institution of Washington, 1923. 98p.

Contributions to embryology. Washington, Carnegie institution, 1922. 162p. il. plates

Enseignement agricole; lois, décrets, arrêtes, circulaires et instructions. Paris, Imprimerie nationale, 1921. 246p.

Ontario, Agricultural development board. Report vol. 1, 1922. 10p. mimeo.

Etude sur les champignons parasites, par G. Arnaud. Paris, Librairie agricole de l'institut national agronomique, 1921, 115p il. plates.

The agricultural credits act of 1923. Washington, Government printer, 1923. 32p.

Législation relative au crédit mutuel et à la coopération agricoles. Paris, 1922. 77p.

Studies in the physiology of the fungi. St. Louis, Washington university. 10 pamphlets.

'Meat production, consumption, and foreign trade in United States, 1907-1922, comp. by John Roberts. Washington, Government printer, 1922. 9p. mimeo.

The marvel of irrigation, by R. L. Adams and W. W. Bedford. San Francisco. 1921. 71p.

Dominion of Newfoundland and Labrador; some information about the resources of the ancient colony. London, High commissioner for Newfoundland, 1921. 155p. il. maps.

The pleistocene of North America and its vertebrated animals from the States east of the Mississippi river and from the Canadian provinces east of longitude 95, by O. P. Hay. Washington, Carnegie institution, 1923. 499p. il.

Enquête sur le travail agricole. Bruxelles, Vromant & co. 1920. 880p.

Venezuela, an economic report presented by students of the school of foreign service as an aid to the foreign trade of United States. Washington, Published by the university, 1921. 166p.

History of Aberdeen-Angus cattle in Great Britain and America. Chicago, American Aberdeen-Angus breeders' association, 1922. 40p.

Report of the commission appointed to inquire into the operation of "The rural credits act." Winnipeg, 1923. 22p.

Le bon vigneron; art de cultiver la vigne, de faire le vin et d'obtenir des raisins de table, par G. Couanon. Paris, Librairie agricole de la maison rustique, n.d. 160p.

The Salton Sea; a study of the geography, the geology, the floristics, and the ecology of a desert basin, by D. T. MacDougal. Washington, Carnegie institution, 1914. 182p. il.

Inter-departmental committee on the laws, regulations and procedure governing the sale of milk in Scotland. Report. Edinburgh, H.M.S. Office, 1922. 127p.

Report of the committee on agricultural credit. London, H.M.S. Office, 1923. 39p.

Laboratory manual for farm gas engines, by F. W. Duffee. Madison, Dept. of agricultural engineering, University of Wisconsin. 58 p.

Report on the fixation and utilization of nitrogen. Washington, Government printing office, 1922. 353p. il.

Comparison of tariff acts. Washington, Government printer, 1922. 379p.

Report on the statistical work of the U.S. Government. Washington, Government printer, 1922. 405p.

Report of the commissioner on banking and credit with respect to the industry of agriculture in the province of Alberta. Edmonton, 1922. 49p. mimeo.

Guide pratique pour la tenue de la comptabilite d'une caisse locale de credit agricole mutuel. Paris, Imprimerie nationale, 1919. 55p.

For better relations with our Latin American neighbors; a journey to South America, by Robert Bacon. Washington, Carnegie endowment for international peace, 1916. 222p.

The pears of New York, by U. P. Hedrick. Albany, N.Y. Dept. of agriculture, 1921. 636p. il.

Manual pratique de culture fourragere, par MM. Denaiffe & Colle. Paris, Librairie J. B. Bailliere et fils, 1920. 402p. il.

Intelligence tests and school reorganization, by L. M. Terman & others. Yonkers-on-Hudson, World Book co. 1922. 111p.

Modes of research in genetics, by R. Pearl. Toronto, Macmillan, 1915. 182p.

The Cornish fowl, by F. H. Bohrer. Utica, N.Y., The author, 1922. 83p.

Pronunciation of plant names. New York, Garden club of America, 1922. 94p.

Rural credits system for the United States, by Herbert Myrick. New York, Orange Judd co. 1922. 239p.

Bank credit and agriculture, by Ivan Wright. New York, McGraw-Hill book co. 1922. 340p.

La taille Lorette, par M. Louis Lorette. Versailles, 1921. 230p. il.

The mutation theory, by Hugo de Vries. Chicago, The Open Court publishing co. 1910. 2 volumes.

Market milk, by Ernest Kelly and C. E. Clement. New York, John Wiley & sons, 1923. 445p. il.

Color standards and color nomenclature, by R. Ridgeway. Washington, The author, 1912. 53 colored plates.

Farm horticulture, by G. W. Hood New York, Lea & Febiger, 1921. 354p.

The feeding of animals, by W. H. Jordan. Toronto, Macmillan, 1917. 473p. il.

The modern farm cooperative movement, by C. C. Sherlock. Des Moines, Iowa, 1922. 377p.

Home tanning and leather making guide, by A. B. Farnham. Columbus, O., A. R. Harding, 1922. 176p. il.

Age and area; a study in geographical distribution and origin of species, by Dr. J. C. Willis. Toronto, Cambridge university press, 1922. 259p.

The continental system, by E. F. Heckscher. Washington, Carnegie endowment for international peace, 1922. 420p.

An introduction to vegetable physiology, by J. R. Green. London, J. & A. Churchill, 1911. 470p. il.

Standard methods for the bacteriological examination of milk. Boston, American public health association, 1921. 24p.

The Southdown sheep, by E Walford-Lloyd. Chichester, Eng., I. G. Willis, 1922. 48p. il.

Urban land economics, by R. T. Ely and others. Ann Arbor, Mich , Edwards bros. 1922. 145p. mimeo.

Beautiful flowering shrubs, by G. C. Nuttall. Toronto, Cassell & co. 280p. il.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Report of the Agricultural Instruction Act, 1921-22.

Animal Husbandry Division—Interim Report of the Dominion Animal Husbandman, G. B. Rothwell, B.S.A., for the year ending March 31, 1922. Dominion Experimental Farms.

Pigeons.—By Geo. Robertson, Assistant Dominion Poultry Husbandman and W. W. Lee, Poultry Husbandman, Poultry Division. Bulletin No. 15—New Series. Dominion Experimental Farms.

Meilleur Cheese.—By S. J. Chagnon, B.A., B.S., Assistant to Dominion Animal Husbandman and Jos. Meilleur, Dairyman, Experimental Farms Branch. Pamphlet No. 27—New Series.

Aphids or Plant Lice.—By W. A. Ross, Entomological Laboratory, Vineland Station, Ont. Pamphlet No. 31—New Series. Entomological Branch.

Manitoba Approved Flocks—By A. C. McCulloch, B.S.A., Live Stock Branch, Poultry Division. Pamphlet No. 25—New Series.

The Hessian-Fly in the Prairie Provinces.—By Norman Criddle, Entomologist in charge for Manitoba. Pamphlet No. 30—New Series, Entomological Branch.

In the Trough of the Wave.—By W. D. Albright, Superintendent, Experimental Substation, Beaverlodge, Alta. Pamphlet No. 26—New Series. Experimental Farms Branch.

Experimental Farm, Brandon, Man., 1922.—Report of the Superintendent, W. C. McKillican, B.S.A. Dominion Experimental Farms.

The Dairy Produce Act and Regulations.—Administered by the Dairy and Cold Storage Branch. Acts, Orders and Regulations No. 6

ONTARIO

Report of the Minister of Agriculture for the Province of Ontario.—Year ending October 31, 1920.

Ontario Agricultural College and Experimental Farm, 1921.—Forty-seventh Annual Report.

Entomological Society of Ontario, 1921.—Fifty-second Annual Report.

Fruit Growers' Association of Ontario, 1921.—Fifty-third Annual Report.

Beekeepers' Association of Ontario, 1921.—Forty-second Annual Report.

Live Stock Branch, 1921.—Annual Report.

Feeding Young Live Stock.—By L. Stevenson B.S.A., M.S., Secretary and Supervising Director, Department of Agriculture.

Grafting Fruit Trees.—By Jas. A. Neilson, B.S.A., M.S. Ontario Agricultural College. Bulletin No. 294.

The European Corn Borer in Ontario.—By G. J. Spencer, Department of Entomology, Ontario Agricultural College, Guelph, and H. G. Crawford, Entomological Branch, Dominion Department of Agriculture, Ottawa. Bulletin No. 295.

QUEBEC

Report of the Minister of Agriculture for the Province of Quebec, 1921-22.

MANITOBA

Financing the Home.—By Mrs. Lottie J. Duncan, Lecturer in Household Management, Manitoba Agricultural College, Extension Bulletin No. 57.

Hatching, Brooding, Rearing and Feeding Chicks.—By M. C. Herner, B.S.A., Professor of Poultry Husbandry, Manitoba Agricultural College. Extension Bulletin No. 35—Third edition.

Color and Design in Relation to Dress.—By Mrs. Jean South, Lecturer in Household Art, Manitoba Agricultural College. Extension Bulletin No. 58.

Hand Selection and Harvesting of the Seed Plot.—By W. T. G. Wiener, B.S.A., Department of Field Husbandry, Manitoba Agricultural College. Extension Bulletin No. 49. Superseding Extension Bulletin No. 5.

Management of the Brood Mare and Foal.—By C. D. McGilvray, M.D.V., Lecturer in Veterinary Science, Manitoba Agricultural College. Extension Bulletin No. 11—Second Edition.

Poultry Diseases.—By M. C. Herner, B.S.A., Professor of Poultry Husbandry, Manitoba Agricultural College. Extension Bulletin No. 32—Second Edition.

Lessons on Weeds.—By V. W. Jackson, Professor of Botany, Manitoba Agricultural College. Extension Bulletin No. 30—Third Edition.

Poultry Houses for Farm and Town.—By M. C. Herner, B.S.A., Professor of Poultry Husbandry, and R. Mitchell, Agricultural Engineering Department, Manitoba Agricultural College. Extension Bulletin No. 15.—Third Edition.

Common Diseases and Disorders of the Foal.—(Sequel to Extension Bulletin No. 11, "Management of the Brood Mare and Foal"). By C. D. McGilvray, M.D.V., Lecturer in Veterinary Science, Manitoba Agricultural College, Extension Bulletin No. 13—Second Edition.

Canning by the Cold Pack Method.—Revised from former editions by Miss Mary C. Hiltz, B.S., Professor of Household Science, and C. H. Lee, M.A., Professor of Bacteriology, Manitoba Agricultural College. Extension Bulletin No. 12.—Fifth Edition.

Cheese-Making on the Farm.—By I. Villeneuve, Instructor in Cheese Making, Dairy Branch, Department of Agriculture and Immigration, Winnipeg. Extension Bulletin No. 20.—Second Edition.

Agricultural Society Activities.—By S. T. Newton, Director, Agricultural Extension Service, Department of Agriculture, Winnipeg. Extension Bulletin No. 36.

SASKATCHEWAN

Summer Fallow Substitutes for Saskatchewan.—By Manley Champlin, Professor of Field Husbandry, College of Agriculture, University of Saskatchewan. Agricultural Extension Bulletin No. 16.

ALBERTA

Roughages for Wintering Pregnant Ewes.—By A. A. Dowell and J. E. Bowstead, Department of Animal Husbandry, College of Agriculture, University of Alberta.—Bulletin No. 1.

NEW BRUNSWICK

Annual Report of the Department of Agriculture for the year ended October 31, 1922.

MISCELLANEOUS

Federal Aid to Agriculture by the Parliament of Canada under the Agricultural Instruction Act of 1913.—Published by the Canadian Education Association.

Planting and Care of Roadside Trees.—Appendix to the annual report of the Department of Public Highways. Publication No. 34.

Canadian National Live Stock Records.—Report of Record Committee to Record Board and Record Associations for the year 1922.

Canadian Swine Breeders Record.—Volume 33. Compiled and edited in the office of the Canadian National Live Stock Records, Ottawa.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

SCIENCE AND PRACTICE OF AGRICULTURE

GENERAL INFORMATION

367.—The Standardization of Field Experiments.—Wiancko, A. T., Arny, A. C., Salmon, S. C. (Committee on Standardization of Field Experiments), in *Journal of the American Society of Agronomy*, Vol. XIII, No. 9, pp. 368-374. Bibliography. Lancaster, Pa., January 28, 1922.

The Committee appointed by the American Society of Agronomy for standardizing the methods of conducting field experiments has for many years been making a careful study of the question. Information concerning the practice of the majority of the Experiment Station workers in the United States has been collected. With the data at hand, the Committee now feels that the Society of Agronomy should begin to define and adopt certain standards for locating, laying out and conducting the ordinary kinds of field experiments.

The great variety of conditions under which field experimental work must be done makes it impossible in certain respects to lay down any but very general rules. Some guiding principles can, however be fixed in order to make such work more uniform and the results more accurate. The chief points in the author's paper may be summarized as follows:

Recommended Standards for Field Plot Experiments in Soil Fertility.—In each locality, one type only of soil should be represented in any one experiment; it is therefore necessary before beginning the experiments to ascertain the uniform character of the piece of land chosen; topographically, it should be reasonably level and slope in one direction only; otherwise special precautions must be taken to prevent soil washing. When artificial drainage is required, the drains should be so arranged as to influence all parts alike. Where irrigation is practised, provision should be made to water all plots at the same time and at the same rate. While the size of the plots must often be governed by the number of plots required for the particular experiment, and the amount of land available, twentieth-acre to tenth-acre plots will usually be found the best where horse and machine labour are to be used. Long, narrow plots laid out crosswise to the greatest soil variation are preferable to square or oblong plots as these are more likely to show important differences in soil fertility. The four corners of any series of plots should be indicated by permanent marks. Check plots receiving a uniform soil treatment to maintain them in a reasonable state of productivity should be regularly distributed throughout the series. At least every fourth plot, preferably every third, should be such a check plot in each series and one or more untreated plots should also be included. The complete series of treatment should be repeated as many times as there are crops in the rotation employed. In all soil fertility experiments, the plots must be separated by untreated interspaces at least 3 ft. in width, and the entire series of plots should be surrounded by regularly planted side and end border strips to be cut off at harvest time. Only high quality acclimatized seed of standard variety should be used and it must be uniformly treated. The calculation of increases due to treatment should be based on the assumption that the difference between the two check plots is uniformly progressive. All cultural operations, except ploughing, should be conducted lengthwise of the plots to prevent all possibility of moving soil or fertilizer from one plot to another. Ploughing should however usually be crosswise of the plot, and hill-planted crops may be cross-cultivated. Yields ought usually to be determined by harvesting and weighing the produce of the entire plot; the produce must be uniformly dried before weighing. Should this have been omitted, the moisture content ought to be determined and proper corrections made before recording the weights.

Recommended Standards for Field Experiments With Farm Crops.—All seeds used for planting must be of known vitality and free from mixture, weed-seeds and contamination

or infection by disease. The soil for experimental plots ought to be as nearly as possible of the type prevailing in the area where the data from the crops grown on them are to be applied. As a rule, relatively long and narrow plots are to be preferred, but they must be sufficiently wide to allow for the removal of border-rows (2 in the case of cereals and 1 for intertilled crops). Practically, 5 ft. or more is a good width for plots planted with small grains and forage crops; in the case of intertilled crops, sufficient width should be allowed for 4 rows. Adequate repetition of varieties or treatments renders unnecessary the use of check plots. In fact the number of years a test is continued together with the number of plots devoted to any one variety or treatment, and the size of the plot are in definite relation to the probable error for any particular test. When single plots of varieties or treatments are used, the probable error will average lower on tenth acre plots than on plots of smaller size. The increase in probable error is however relatively small when the decided reduction in size of the plots is considered. By repeating varieties or treatments a sufficient number of times on regularly distributed plots of any size adapted to the purpose of the experiment, the probable error for the test may be reduced to any point considered necessary. For ordinary conditions, from 2 to 5 repetitions are recommended; two plots of any variety or treatment, continued through 4 years, or 3 plots continued for 3 years should be regarded as the minimum. New varieties or cultural treatments materially different from those in common usage should not be recommended for general use, unless supported by at least 3 years of repeated and carefully conducted experiments within the area for which the recommendations are made.

To the article are appended additions to the bibliography published in 3 previous issues of the Journal of the American Society of Agronomy.

CROPS AND CULTIVATION

809.—Sweet Clover as a Green Manure.— WHITING, A. L., and RICHMOND, T. E., in *University of Illinois Agricultural Experiment Station, Bulletin No.* 233, pp. 255-267. Urbana, May 1921.

Sweet clover (*Melilotus alba*) should prove a promising source for supplying nitrogen to the chief farm crops. Certain characteristics give it a marked superiority over other crops as a green manure. The most important of these are:

Adaptability to a wide range of climatic and soil conditions, if the soil is not acid and inoculation is assured; hardiness to cold and drought, resistance to disease and damage from weeds; vigorous growth; rapid decomposition whilst green, deep-rooting habit which renders impervious subsoils more porous and of higher nutritive value.

A crop that possesses the combined capacity to grow rapidly in early spring and to decompose readily, makes an ideal green manure. Owing to its rapid growth clover conserves large amounts of soluble plant food, utilizable when the soil would otherwise suffer heavy losses. Similar to other legumes, when properly inoculated, the plant can utilize atmospheric nitrogen which it stores in its roots as reserve food material. The leaves are very tender and decay immediately after the crop is turned under green. The roots and stems decay more slowly, thus the different parts represent three sources of nitrogen which furnish three rates of nitrate production.

Hitherto considered as a weed, the sweet clover is now coming to be regarded as the best crop for soil improvement. As it will supply nitrogen at a low cost, it could be employed on a large scale.

The literature concerning sweet clover as a green manure and as a source of nitrogen, is very limited. Having been classed for some time as a weed, it has received very little attention by investigators. ORTH in 1890 was the first to test the value of this crop as a green manure and proved its superiority over farmyard manure for the production of potatoes, oats and maize. G. B. HOPKINS recognized the possibilities of this plant as a green manure and in his book on "Soil Fertility and Permanent Agriculture," he states that 6½ tons of dry matter furnish as much humus and nitrogen as would be furnished by 25 tons of average farmyard manure. The appreciation of the importance of this crop is evident in that he introduced it into the rotations on several experiment stations and also selected sweet clover as the crop upon which to base his foundation work for restoration of the soils of Greece. In 1917, MAYNARD studied the decomposition for nitrate formation under glass and found it to be very rapid. He mentions that no record has been found of any study of the rate of decay of sweet clover as a green manure.

The work of MERTZ deserves attention, especially designed to compare the value of various green manures, leguminous and non-leguminous, the latter being reinforced with artificial nitrogenous fertilizers. The experiment was conducted in South California. The crops grown for green manures in the winter were followed by maize, potatoes, cabbage, beets, sorghum and Sudan hay, for six successive years. The legumes proved much superior to the non-legumes and amongst the former the bitter clover (*Melilotus indica*) an annual variety of sweet clover was the most promising, both from the standpoint of vigour, of seed supplies and as a green manure. The use of

M. indica resulted in a gain of nearly 20 bushels of shelled maize per acre. This compares favourably with results obtained with an annual application of sodium nitrate giving 1,080 lb. per acre of maize and of dried blood giving 1,200 lb., taking into account also the cost of these fertilizers.

The advantage of utilizing the crop as a manure has been proved by the authors in their experiments made (1918-19) on 5 especially selected fields in northern, central and southern Illinois, in connection with the University farm, Urbana. A series of plots was arranged as follows: sweet clover; green manure; control; to the sweet clover and manured plots, rock phosphate or bone-meal was added once in four years. On the sweet clover green manure plots, residues were added to compensate for corn stubble. A distinction should be drawn between available and non-available nitrogen as it is most important to keep as much nitrogen as possible in the available form. This is exactly what happens in the case of leguminous crops, which help to contribute large quantities of available nitrogen. The results obtained by the authors indicate that after digging in, the sweet clover tends to increase the proportion of nitrates in the soil, even more than heavy application of manure. In poor soils, the effect is even more marked. The maximum nitrate production was noticed in August which suggests the advisability of ploughing under at an earlier date, and so avoiding any detrimental effect (due to decomposition) on the germinating maize. Another suggestion is the utilization of the surplus nitrate by sowing a catch crop. When maize is the main crop, the value of the additional nitrate remains although quickly utilized by the crop. Even when manure, lime and phosphate have been used in large quantities (5 times normal application) the yields were not equal to those obtained after sweet clover.

The average for the 2nd year sweet clover crop was 87·6 lb. nitrogen per ton of dry matter, the cutting was made before sowing the maize. The subsequent advantage was evident.

These results furnish positive information concerning the value of sweet clover when used as a green manure, for adding to, conserving and making available for crop purposes the nitrogen of the soil. It is well known that, except for manure, the animal sources of nitrogen (dried blood, tanning residue, guano) are scarce and costly and therefore unsuitable for use on a large scale. This applies also to the use of nitrogenous fertilizers (sodium nitrate, sulphate of ammonia, ammonium phosphate and calcium cyanamide). On the other hand, the leguminous crops offer an exceptional advantage, and sweet clover in particular may in the future occupy a prominent position as a green manure.

692.—The Effect of Straw on the Biological Soil Processes.—MURRAY, T. G., in *Soil Science*, Vol. XII, No. 3, pp. 233-259, bibliography of 14 works. New Brunswick, N.J., Sept. 1921.

In the wheat-growing areas to the east of Washington the return of straw to the land constitutes the only practical method of restoring organic matter to the soil, but it is known that this reduces the yield of the succeeding crop.

It was considered advisable to ascertain the reason for this reduction in crop yield, and if possible to devise a method by means of which the straw could be utilized without this drawback.

The matter had already received attention: STORMER showed that the addition of carbon bisulphide to a soil treated with straw doubled the yield. VAN SEELHORST and FRECKMANN found that when nitrates were applied, denitrification was proportional to the amount of straw present, and that lime and sulphuric acid lessened, but did not overcome the effect of the straw on the crop yield. CHIRIKOV and SCHMUK state that on sandy soils calcium carbonate acts in the same manner, and that the injurious effect of the straw is not due actually to denitrification, but to the conversion of nitrates into insoluble nitrogen compounds. BISCHOFF grew mustard and buckwheat and found that on sandy soils the injurious effect of straw was more marked than in the case of clay soils and that nitrate of soda reduced the loss. VON MAY studied the effect of straw on potatoes and suggests that the loss is caused by the fact that micro-organisms appropriate the available nitrogen as a source of energy. DORYLAND in the case of oats, found that the addition of straw in large quantities to the soil caused a decrease in the ammonifying power and an increase in the consumption of ammonia and nitrates; these results were due to an increase of micro-organisms favoured by the addition of straw, the same effect being produced by the addition of dextrose to soil.

The author placed soil in glass tumblers containing about 130 gms. and added finely chopped straw in amounts from 0·1 gm. to 5 per cent and 0·2 gm. of ammonium sulphate.

The tumblers were kept at a temperature of 20° C. And the work was carried out in duplicate, with controls. Determinations of nitrate content and total nitrogen were made every six weeks.

After 18 weeks, there was a loss in every case in nitrate formation, and a reduction of the original nitrate content, proportional to the addition of straw. When more than 0·9 per cent straw is present a harmful effect is exerted upon the process of ammonification. At the same time, the total

nitrogen remained constant, the nitrates being transformed into organic substances not available to plants. The bacteria increased in numbers, and evidently utilized the nitrates and changed them into more complex forms. The straw also served the bacteria as a source of carbon and the nitrates as a source of nitrogen. The organisms found to multiply in this manner are those usually present in the soil, such as *B. subtilis* and *B. mezatherium*.

Many others were found when straw was present, e.g. *B. succus*, *B. lactis*, *M. radiatus*, but those normally found in soil predominated. The colonies had a softening effect on agar-agar, probably due to the setting free of nitric acid.

The author isolated a species of nitrifying bacterium capable of liquifying agar-agar in a few weeks.

693.—The Influence of Wheat Straw on the Accumulation of Nitrates in the Soil.—Scott, H., in *Journal of the American Society of Agronomy*, Vol. 13, Nos. 6-7, pp. 233-258, bibliography of 28 works Lancaster, Pa., and Washington, D.C., Oct. 15, 1921.

The application of straw to cropped land and its apparently injurious effects, indicates lack of nitrogen and led the author to undertake a study of the effect of straw on the accumulation of nitrates in the soil.

The general problem of organic matter and nitrification has occupied the attention of a large number of investigators. The author reviews the literature on this subject. Winogradsky and Omelianskiy showed that glucose and the peptones retarded the activity of the nitrifying organisms at concentrations exceeding 0·025 per cent; their work being completely arrested by the presence of 0·2 per cent of these substances.

Small quantities of organic matter did not seem, however, to hinder nitrification. As regards the straw, results are contradictory and depend on the amount applied, the type of soil, the quality of the straw, etc. This accounts for the fact that Hill noted a favourable effect, Wright found that the process of nitrification was inhibited until decomposition was well advanced, and Niklewsky demonstrated that straw has an appreciable effect on the action of sulphate of ammonia and nitrate of soda.

The author carried out an experiment under glass and in the field. Nitrate determinations were obtained by the phenol-disulphuric acid colorimetric method of analysis and parallel determinations were made from time to time using the aluminum reduction method.

In the experiments under glass, straw was applied at the rate of 0·5 and 1 per cent. In both cases the nitrates disappeared almost entirely at the end of 15 days. At the end of 36 weeks, the soil with 0·5 per cent straw slightly exceeded the control. If sulphate of ammonia is applied to the straw (0·1 and 0·5 per cent) for 2 weeks, there is a marked decrease in nitrates, but this is followed by a rapid increase up to a maximum of 2·1 per cent of nitrates compared with 0·35 for the control, and 0·30 in the soil to which straw alone had been applied.

In the field several plots of equal size were treated in various ways. The soil is a silt loam and straw applied at the rate of 2 and 4 tons per acre had a distinctly injurious effect on the growth of wheat, hindered ripening and reduced the yield except on plots possessing a high nitrate content at the time when the straw was applied.

In one case, the yield was higher than that of the control. Otherwise, when 4 tons of straw per acre were applied and worked into the surface 6 inches, the nitrate content was low in the spring, but during the summer, the equilibrium was re-established. At the rate of 2 tons per acre, no effect was observed. Four tons of straw applied as a top dressing reduced the nitrate content the following spring and summer; 2 tons had no effect in the spring but a fairly marked increase of nitrates in the summer. Straw application showed the lowest temperature and the highest moisture content, especially as a top dressing.

564. A Monograph on the Wheat Plant.—*Nature*, Vol. 109, No. 2734, pp. 366-368. London, March 23, 1922, and reviewed in *The Gardeners Chronicle*, Vol. LXX, No 1827, p. 331. London, Dec. 31, 1921.

Prof. J. Percival's monograph on the wheat plant, recently published, fills one of the many great gaps in agricultural literature and is a noteworthy contribution to present day knowledge on this ever important subject. It will be read and admired in all countries, and for many years to come. Every detail is founded on the author's own personal experience and the study is peculiarly exhaustive.

The introduction shows how widespread is the cultivation of wheat and it is interesting to note that there is no month in the year during which the wheat harvest is not being carried on in some part of the world. This is indicated as follows:

January: Australia, New Zealand, Argentina, Chile; *February:* India; *March.* India, Upper Egypt; *April:* India, Persia, Asia Minor, Lower Egypt, Mexico, Cuba, *May:* Japan, China, Central Asia, Morocco, Algeria, Tunis, Texas; *June:* South of France, Spain, Italy, Greece, Turkey, Japan, United States (south of 40°); *July:* France, Germany, Austria, Hungary, Roumania, Bulgaria, S. Russia, Canada, N. United States; *August:* England, N. France, Belgium, Holland, Central Russia, Canada, United States; *September:* Scotland, Sweden, Norway,

Canada; *October:* N. Russia, Finland; *November:* South Africa, Argentina, Peru; *December:* Burma, Australia, Argentina.

Apart from the great wheat producing areas, wheat can be grown from beyond the arctic circle to the Equator; it is known to flourish from sea-level up to 10,000 ft. in Mexico, etc., and according to HUMBOLDT, reaches an altitude of 14,000-15,000 ft. in Tibet. So long as the winter temperatures do not fall below —4° F. and the air and soil are dry, the exposed plants suffer little. As regards water supply, an annual rainfall of 20-30 inches is sufficient although some of the Macaroni and Club wheats give remunerative returns in regions where the rainfall is not more than 12-15 in. per annum.

In Part I of the monograph, Prof. PERCIVAL gives the results of his investigations into the morphology, anatomy, growth and development of the plant. The earlier chapters contain detailed descriptions of the grain and its germination illustrated by a wealth of new and admirable pictures, far more illuminating than the well-known illustrations to be found in present botanical text books. The numerous details of the structure and behaviour of the plant testify to the closeness of the observations made, and will be of exceptional value to future investigators.

Part II opens with a discussion on the classification of wheats. This is a subject which the author has made peculiarly his own, seeing that for the last 20 years he has grown annually at the farm attached to the University College, Reading, all available varieties, numbering nearly 2,000 forms derived from almost all the wheat growing regions of the world. As the result of his comparative investigations, Prof. PERCIVAL concludes that in addition to the two recognized wild species (1) *Triticum aegilopoides* Bal. (wild small spelt) and (2) *T. dicoccoides* Korn (wild emmer), eleven races or cultivated species exist, eight of which, viz., *T. monococcum* L. (small spelt), *T. dicoccum* Schubb. (emmer), *T. durum* Desf. (macaroni), *T. polonicum* (Polish), *T. turgidum* L. (Rivet), *T. compactum* (Club), *T. vulgare* Host. (Bread) and *T. spelta* L. (Large Spelt or Dinkel), are well known races; whilst three, viz., *T. orientale* (Khorasan wheat), *T. pyramidale* (Egyptian cone wheat) and *T. sphaerococcum* (Indian dwarf wheat) are new creations. The first of these consists of two emmer-like varieties, differing only in awn colour, and characterized by the possession of long glumes and grain. The second consists of a group of 5 Egyptian wheats resembling the Rivet wheats in most respects, and in leaf colour, shortness of straw and ear shape strongly reminiscent of segregates of crosses between *T. turgidum* and *T. vulgare*. The third is an equally small group of round-grained forms similar to *T. compactum*. The further subdivision of these races into "varieties" follows the well-known system in KORNICKE and WERNER'S *"Handbuch des Getreidesbaus."* It should be noted however that certain forms have been transferred quite rightly to other groups *e.g.* several forms placed by KORNICKE in *T. durum* are transferred to the emmer group *T. dicoccum*, and the Persian Black (*T. dicoccum* var. *persicum*) a form which has puzzled more than one specialist is also placed in this group, to the satisfaction of those interested in the genetics of this important mildew-resisting wheat.

A specially detailed description is devoted to the common bread-wheat, with the numerous bearded and beardless varieties (pp. 265-306). The predominance of these last may be attributed to the digestibility of the flour and the endurance of the plant. The most ancient of cereals, *T. vulgare* now exists in some 14 varieties (7 bearded and 7 beardless), which are easily classified by the colour and degree of downiness of the glumes.

The systematic portion of the monograph is followed by a chapter of considerable interest on the origin and relationships of the races of wheat. Evidence from various sources, archaelogical, ecological, pathological, genetical, etc., is skilfully marshalled to show their probable lines of development. The author as a result of his morphological studies comes to the conclusion that "there is not nor has there ever been a prototype of the bread wheats" and that "the characters of *T. vulgare* and its allies appear * * * to be those of a vast hybrid race initiated long ago by the crossing of wheats of the emmer series with species of Aegilops." He adopts the view that the present day wheats fall into the 3 series already mentioned. The multiplicity of the races is doubtless connected with the fact that, although as a rule self-fertile, wheat is occasionally cross-fertilized and results in consequent natural hybridization.

Artificial hybridization was first started at the end of the XVIIIth century by KNIGHT, but no definitely important results were obtained until 1846 when MAUND and RAYNBIRD produced undoubted hybrids. Since then hybridization has been carefully followed up and important results have been obtained. For example, BIFFEN who first investigated the inheritance of resistance and susceptibility to the attacks of yellow rust (*Puccinia glumarum*) discovered that these characters form a Mendelian allelomorphic pair, and working on this basis, a means of circumventing rust by the production of immune varieties was worked out. A useful summary of most of the more important literature dealing with hybridization and improvement of wheat is given, with details of the most recent hybrids obtained.

The concluding chapter contains an interesting survey of the yield obtained in different

countries, the world's average being 13 bushels per acre. Historical research shows how greatly the yield has been increased during the last few hundred years. With the increase in stock raising and the consequent increase in the amount of manure available, there has been a steady rise in yield. Records show that for Great Britain in the XXth century, the average for the first 20 years was 31 bush. as compared with 10 bush. in the XVIIth century. Occasionally there have been exceptional results: e.g. 96 bush. per acre of Yeoman wheat at Wye, Kent (England), in 1918 and 117·2 bush. per acre in Island County (Washington, U.S.A.), in 1895.

Prof. PERCIVAL also gives details of the effect on yield of soil, cultivation and manuring, seed rate, variety, time and methods of sowing, and size of grain, etc.

570.—**A New Flax Seed in Ireland Giving an Exceptionally High Yield of Good Quality Fibre.**—In *Journal of the Royal Society of Arts*, Vol. LXX, No. 3619, pp. 360-361. London, March 31, 1922.

A new pedigree flax seed has recently been produced by Dr. VAGAS EYRE, Director of the Linen Research Association Institute at Lisburn, near Belfast. Two new varieties of the Livornian strain were discovered, which, on being tested, gave 80 per cent more fibre than any other flax seed on the market and the quality was on the average two grades higher.

It is estimated that the return is 100 per cent better than from the Duroc flax seed hitherto grown and it is reported by a well-known linen manufacturer that the spun yarns are of a more uniform quality. At present there are approximately 5 tons of this seed available.

Further distribution and commercial utilization is under consideration, and while a portion will be given to Irish flax growers another portion will be forwarded to the National Institute of Agricultural Botany at Cambridge, and the remainder sent to Canada, where climatic conditions are favourable for seed development.

405.—**A Bio-Chemical Index for Determining the Vitality of Seeds.**—NEMEC, A., and DUCHON, F., in *Comptes rendus de l'Academie des Sciences*, Vol. 174, No. 9, pp. 631-634. Paris, February 1922.

The authors have shown (*Comptes rendus* Vol. 173, 1921, p. 933) that the activity of the catalyst affords a rapid and easy means of determining the vitality of seeds. They adopted the following method: 2 gm. of finely ground seeds are mixed with 20 cc. of distilled water and put into a flask with a rubber stopper provided with two holes through one of which passes a funnel with a regulating tap, while an escape tube with two bends passes through the other and thence into a vessel of water and under a gasbell graduated to tenths of a cubic centimetre. By means of the funnel are introduced 15 cc. of 3 per cent oxygenated and neutralized water and the amount of oxygen liberated is measured after 5 minutes, and later after 15 minutes.

The results of many experiments have demonstrated that all other factors being equal, the amount of water decreases regularly with the weakening of the germinating capacity.

These results expressed graphically give a regular curve and thus the germinating power of the seeds can be deduced from the amount of oxygen liberated.

In practice, it is well to use the comparative method, and to compare the catalytic activity of the ground seeds under examination with the graphic curve obtained under the same conditions from seeds of known germinative power.

414.—**The New Chinese Variety of Lucerne in South Africa.**—DONKIN, J. E., in the *Journal of the Department of Agriculture, Union of South Africa*, Vol. III, No. 3, pp. 257-258. Pretoria, Sept. 1921.

FAIRCHILDS, the "Agricultural Explorer" of the United States Department of Agriculture, found in Thibet, at a height of about 1,200 feet above sea level, a new variety of lucerne growing on the edge of a swamp. This variety has been tested for a period of five years at the School of Agriculture of Grootfontein near Middleburg, Cape Province, where for purposes of comparison it has been grown side by side with six other well known types.

Although during the first period of growth this "Chinese" variety, as it has been called, could not be considered as equal to the "Provence" and "Tamworth" types, owing to thin seeding, in the last two years of the test it gave hay crops almost equal to those of "Provence" and superior to those of "Tamworth." Observations taken seem to show that "Chinese" lucerne is a hybrid, and several variations in stalks and leaves, etc., are noted. It is a heavy cropper and particularly resistant to frost.

If grown for seed, 1 oz. is sufficient for a row 100 yards long, which in the second year should produce enough seed for one acre; this should in turn produce a sufficient quantity of seed for sowing broadcast several acres every year.

580.—**The Cultivation of Blueberries (Whortleberries) (Vaccinium Spp.) in the United States.**—COLVILLE, F. V., in *United States Department of Agriculture Bulletin No. 974*, pp. 1-24, plates 29. Washington, 1921

Experiments in *Vaccinium* cultivation have been in progress in the United States since 1906 and up to the present, 16 acres

have been planted with 27,000 different hybrid seedlings and certain hybrids have been selected as of value from an agricultural standpoint and are in the hands of nurserymen for commercial propagation. In addition to this, certain wild whortleberry plants have been used with success as breeding stocks. The author gives the reports of these experiments combined with other points of distinct value to the intending grower. Certain points have already been dealt with by the author in a previous article but it is of interest to note that in connection with the acid soil particularly suited to *Vaccinium* cultivation, a specific acidity of 100, corresponding to a hydrogen-ion concentration of $P_H = 8$ is the most advantageous.

As regards propagation, budding appears to be the best means of producing a large quantity of cutting wood but the easiest methods have been layering and the so called tubering, i.e., the forcing of new shoots in such a way that their basal portions are morphologically scaly rootstocks with a strong rooting tendency. A detailed description is given of the points which should be observed in following this system. An experiment has recently been made at Whitesbog in the use of lath instead of muslin shades, which allows each cutting to receive direct sunlight. The proportion of cuttings that rooted under the lath shades has so far shown the distinct advantage of adopting this method.

Wild plants and hybrids vary very much in their response to the different methods of propagation. Cuttings of the variety V. *angustifolium* and hybrids between this wild variety and V. *corymbosum* have shown a higher yield of rooted plants, and in such cases, mound layering has been found the more satisfactory.

Among the cultural operations advised it is noted that in 1919-20 BECKWITH of the New Jersey Agricultural Experiment Station conducted a series of fertilizer experiments and the most successful results were obtained with the following mixture: nitrate of soda 170 lb. + dried blood 230 lb. + steamed bone 340 lb. + phosphate rock 340 lb. + potash 170 lb. The yield was more than 3 times greater than from unfertilized bushes on the same sandy soil. The application of this fertilizer is recommended at the rate of 600 lb. per acre.

V. corymbosum does not require yearly pruning but it has been found advisable to remove all the stems of *V. angustifolium* more than one year old, which have not made vigorous growth during the season, good results in fruit yield being thus obtained. A systematic burning once in three years of areas devoted to the cultivation of this variety has led to vigorous development in the form of stems bearing large leaves and an abundance of fruit buds which give excellent yields, the second summer after burning.

The industrial advantages attached to this crop are evident after observation of the yields and returns recorded at Whitesbog (N. J.) viz., an average yield of 96 bushels per acre, sold at rather more than $10 per bushel, the receipts being at the rate of $966 per acre. This record refers to plants 7 years old. The following year (1920) this planting yielded at the rate of 117 bush., i.e., $1,280 per acre. After a plantation has been once established its maintenance is relatively inexpensive.

LIVE STOCK AND BREEDING

598.– The Use of Calcium Salts in the Feeding of Animals.—*Ohio Agricultural Experiment Station*, *Bulletin* 347, pp. 99. Wooster, Ohio, 1921.

The bulletin analysed contains the following 6 papers:

I. FORBES, E. B., HALVERSON, I. O., MORGAN, L. E., and SCHULZ, J. A. *The Metabolism of calcium salts in a growing pig.* Experiments to determine the metabolism of the mineral constituents of the ration, were carried out in November-December 1917, with 5 young castrated boars of the Poland China Breed. There were three experimental periods of 10 days each, separated by intervals of 7 days. To a basal ration consisting of maize flour + linseed cake + wheat sharps (7 : 1 : 1) with salt in the proportion of 1 : 450, were added various mineral supplements.

It was found that the characteristics of the metabolism of swine fed almost exclusively on the grain of cereals were as follows: loss of calcium, abnormal gains in magnesium and phosphorus, very acid urine containing much ammonia. An excess of potassium was present in the basal ration, whereas sodium and chlorine, except for the small quantities supplied in the form of kitchen salt, were lacking.

The insufficient assimilation of calcium is an important factor in determining the gains in phosphorus and to a lesser degree, in magnesium. The increasing ingestion of calcium in the form of precipitated carbonate or powdered limestone, causes a marked increase in the calcium, magnesium and phosphorus gains.

The addition of 1 part of salt to 450 parts of grain, the basal ration, causes a gain in both sodium and chlorine. The gains in sodium and potassium were, as a rule, almost equal. The gain in sodium was more quickly satisfied than that of chlorine. All the mineral additions, especially the precipitated bone-meal, served to increase the chlorine gains as compared with the basal ration, without any addition.

The magnesium content of all the rations was sufficient. When the magnesium metabolism was negative, the loss was due to the hindering effect of other factors, especially to insufficient ingestion of calcium. All the mineral additions had a favourable influence upon the magnesium gains. In some cases, the improvement of the latter were to be attributed entirely to the increase in the amount of calcium ingested.

Ground limestone, precipitated bone-meal, degelatinized bone-meal and precipitated carbonate calcium had much the same effect on the calcium gains, whereas ground mineral phosphate was clearly less effective.

The gain in phosphorus was distinctly increased by all the additions containing calcium, whether in the form of the carbonate or the phosphate.

The solubility of the compounds seems to be the chief cause of the gains; precipitated calcium carbonate and precipitated bone-meal are the most effective, ground mineral phosphate having much less effect. Compared with the potentially acid, basal ration, the compounds containing calcium carbonate lowered the acidity and the ammonia of the urine, but precipitated bone-meal (containing bicalcic phosphate) increased them.

Mineral additions had no effect upon the digestibility of the ration.

One-third of the sodium evacuated by the organism was found again in the urine and one-third in the faeces.

Generally, over 90 per cent of the chlorine passed into the urine.

The capacity possessed by the digestive apparatus of absorbing mineral foods is limited in the first place by their solubility and afterwards, amongst other factors, by the rapidity with which these substances pass from a soluble to an insoluble condition in the blood and lymph, either by means of a synthetic process, or as a result of excretion. The gains in absorbed mineral nutrient substances are governed by the requirements of nutrition, and are not increased by limiting elimination which would immediately decrease absorption.

The most effective, and certainly the most soluble mineral additions used were precipitated carbonate and precipitated bone-meal. Other compounds may be more practical, though less effective, if the pigs will eat them and can tolerate them when fed in sufficient quantities. The most urgent mineral need of growing animals, after common salt, is satisfied by calcium carbonate. When, however, the assimilation of the phosphorus, which is normally present in the ration for the building up of the skeleton, is thus assured, some form of calcium phosphate must be given.

With a certain loss of phosphorus, all the need for mineral additions can be satisfied by calcium phosphate. The phosphate is dearer than the carbonate, but it is more easily tolerated, and if fed separately from the ration, is more acceptable to the stock.

II. FORBES, E. B, HALVERSON, J. O., SCHULZ, J. A., and WELLS, E. B. *Metabolism of some calcium salts in growing swine.*—A second experiment to ascertain the metabolism of the mineral constituents of the ration was carried out from August to October, 1918 with 4 castrated pigs of the Poland-China breed. The chief object of the experiment was to compare the effects of the addition of mixed minerals with those of minerals introduced separately. The results connected with the metabolism of calcium, magnesium and phosphorus are given.

As in the preceding experiment, the metabolism of sodium, magnesium, chlorine, sulphur and nitrogen was also studied. The results were practically the same, although there was a larger proportion of potassium in the urine. The authors bring out the independent behaviour of sodium and chlorine. All additions containing calcium were useful, from 5 to 10 tenths of the calcium administered was retained by the organism; no appreciable difference existed in the capacity of assimilating the various additions.

III.—FORBES, E. B., and SCHULZ, J. A. *The effect of mineral additions upon the development of swine.*—Thirty Duroc-Jersey pigs of the average weight of 136 lbs. were divided into 5 lots and given experimental rations for 86 days dating from April 30th, 1917. The basal ration was the same as in the two previous experiments. The mineral additions were chosen so as to supply 5 mg. of calcium per head and per day. At the end of the experiment, the animals were slaughtered and their skeletons physically and chemically examined. The pigs of the lot given precipitated calcium carbonate and those which received precipitated purified bone-meal had relatively compact, strong skeletons, whereas the bones of the pigs that had been supplied with ground mineral phosphate were only a little denser than the bones of the control animals (ration without supplementary calcium salts) and were less resistant than those of the latter, as well as containing a smaller amount of ash per unit of volume. The skeletons of the pigs given precipitated bone-meal occupied an intermediate position as regards density and resistance. The proportion between the phosphorus and calcium present in the bones of pigs was fairly high whether they had received mineral phosphate, or the basal ration. In this, the bones differed from those of the young animals killed at the beginning of the experiment in order to determine their initial composition, in which the proportion of the magnesium present in the skeletons of the young pigs was relatively lower than that of the calcium.

IV.—Forbes, E. B., Hunt, C. A., Schulz, J. A., and Winter, A. R., *Effect of mineral addition on the development of swine.*—The experiments described in this paper began on July 26, 1919, and lasted nearly 16 weeks. They differ from the preceding experiments in that the mineral addition instead of being mixed in a given proportion with the rest of the ration, was fed separately and *ad lib.* Further, a larger number of additional substances were given and more determinations of the physical characters of the bones were made. The pigs were hybrids with a predominance of Duroc-Jersey and Chester-White blood.

The animals were divided into 8 lots each containing 5 individuals with an initial weight of about 46 lb. per pig. The basal rations consisted of maize flour, wheat sharps and linseed meal cake (3 : I:) with the addition of one part in 500 of kitchen salt. The mineral additions were given to 7 lots in the buckets of an automatic distributor, 5 per cent of sodium chloride being added each time. During the first 5 weeks, the pigs did not relish these additions to their ration, but later when they were shut up in a brick-paved stye, they ate them in large quantities. The additions given to the various lots, the amounts eaten, and certain characters of the bones determined after the animals were slaughtered are summarized in a table.

The penetrability (hardness) was determined by means of a specially constructed microdynamometer measuring the penetration of a diamond-pointed punch 5 mm. in diameter under a pressure of 9 kg. The operation was carried out upon a transverse section from the narrowest part of the diaphysis; its faces were exactly parallel, and polished by a special apparatus. Both these machines were invented by Dr. Joseph Head, of Philadelphia.

Mineral phosphate did not make the skeleton stronger as compared with the effect of the ordinary ration without any addition, whereas all the other mineral supplements produced considerable and almost identical increases in the strength of the bones.

Degelatinized purified bone-meal makes the bones damp, less fat and more acid (both as regards volume and dry fat-free material) than any other mineral addition. The calcium and carbon dioxide contents (except the hardness) exceeded those of all the other lots, but the magnesium content was the lowest of all. The bones of the control lot were relatively poor in mineral constituents other than magnesium.

The hardest bones were characterized by a larger proportion of calcium, carbon dioxide, and ash, and by the low magnesium content of the fat-free, dry bones, as well as by the smaller amount of magnesium in the total number of mineral constituents determined (calcium, magnesium, phosphorus and carbon dioxide).

The softest bones were characterized by the larger amount of magnesium and phosphorus and the smaller quantity of calcium and of carbon dioxide in the total of the constituents determined.

The difference between these two lots bring out the relative value of ground mineral phosphate and of purified bone-meal as mineral supplements for young animals. The mineral substance of bones is a mixture of carbonates and phosphates capable of change as a result of the selection of the carbonates serving as part of the alkali reserves of the organism. The authors are of opinion that in lots 1 and 8, the low proportion between carbon dioxide and the phosphorus of the bones shows that some elimination of the calcium carbonate has taken place to compensate for the lack of potential alkali. This causes the formation of softer bones owing to the large proportion of magnesium phosphate

V.—Forbes, E. B., *Additional foods consisting of more or less appetizing mineral preparation for swine, cattle and horses.*—The author has made 19 experiments with pigs and 15 with cattle; he has found that horses also readily eat precipitated bone-meal and purified degelatinized bone-meal.

In these experiments with pigs, the author observed that purified degelatinized bone-meal, which under certain conditions, was the most liked, could be rendered still more acceptable by the addition of a little acid.

Meat meal increased the flavour of the mineral supplement with which it was mixed; the best results are obtained with blood meal, Coriander seeds, and molasses also increased the flavour of the added minerals, but not as much as the above-mentioned meals. On the other hand, anise, fenugreek, caraway, fennel, charcoal, humus and ground lucerne hay had no effect. Preparations in the form of fine powder caused disturbances.

VI.—Forbes, E. B., Halverson, J. O., and Schulz, J. A.—*The effect produced upon the alkali reserves of the pig by a diet of grain and mineral supplements.*—Two pigs were fed a basal ration composed of maize flour + wheat sharps + linseed-cake + kitchen salt for 33 days. This period was followed by another during which precipitated calcium carbonate was added to the ration and the experiment terminated with a further period of 23 days during which precipitated bone phosphate was added to the basal ration.

The mineral additions were given at the rate of 0·2 gm. per kg. of live weight.

The consumption of calcium carbonate, which is potentially basic, increased the carbonate dioxide pressure of the blood plasm and decreased the ammonia content and the hydrogen ion concentration of the

urine. Bone phosphate, being potentially acid, had just the opposite effect. It is therefore probable that the alkali reserves of the blood plasm can be greatly altered by the character of the mineral substances added to the ration.

739.—The Application to Stock-Breeding of Some New Views Concerning Heredity. —DECHAMBRE, P., in *Comptes rendus de l'Académie d'Agriculture de France*, Vol. VIII, No. II, pp. 359-365. Paris, March, 1922.

The progress of stock-breeding is intimately connected with the possibility of fixing by heredity the variations, or characters, that will improve the quality of animals. Hence the attempt to apply to stock-breeding the knowledge obtained from the researches on heredity that have been carried on for several years in the scientific world.

From among the new facts concerning heredity that are of almost direct application to stock-breeding, the author singles out for special mention those bearing on the dominance of certain characters.

Generally speaking, albinism in all species is recessive. Thus, the products of a cross between breeds with pigmented mucous membranes and those with non-pigmented mucous membranes have coloured mucous membranes. Of this there are several instances in cattle: the hybrids of Charolais X Schwitz in the District of Aube and Côte d'Or are white like the Charolais breed, but have a black muzzle; the hybrids of Charolais X Vendée breed are large animals with light coats, but black mucous membranes and legs; the hybrids of Limousin X the Brown Cevennes breed have the good conformation of the Limousin parent but black coat and legs.

Southdown rams, when crossed with white ewes, produce lambs with greyish faces and legs.

As dominant characters the author mentions the tuft of the Paduan fowl and the long hair of the guinea-pig. In horses, black and bay coats are dominant as regards chestnut, and grey and roan as regards bay.

In cattle, hornlessness is dominant as regards the possession of normal horns. When a polled bull is crossed with a normally horned cow, polled offspring are obtained. This was discovered in England a long time ago by crossing the Angus and Shorthorn breeds. The Sarlabot breed originated from a similar cross between the Normandy and the Angus and Red Polled breeds. This cross was effected in 1852 and the polled character of the progeny was immediately fixed. For the last fifteen years, the author has used the Sarlabot breed in his crossing experiments at Grignon, where its essential character, absence of horns, proved itself to be dominant.

Early maturity, and high milk yield are some of the dominant physiological characters.

Dominance does not, however, always manifest itself even when the contrasting characters are well-marked. Piebald lambs with large black and white patches and "half-tail" resulted from the crossing at Grignon of a Berrichon ram with slender tail, and Somali ewes with thick tail, white body, and black head and upper portion of the neck.

Some colours are sex-linked, thus if a silver Hamburg hen is crossed with a golden Hamburg cock all the hen chicks are golden and all the cockerels silver.

Although the products of the first cross are generally very much alike owing to the presence in the parents of dominant and recessive characters, all homogeneity is lost when the hybrids are mated up together and the recessive characters again make their appearance.

This was discovered some time ago by the Marquis of Behague in the case of Southdown X Berrichon lambs and it is therefore not advisable to mate hybrids together, but to obtain them direct by the crossing of pure-bred parents. This is very commonly done amongst sheep breeders supplying the meat market, and is now gaining ground among cattle-breeders, pig-breeders and even poultry rearers in the case of produce destined for the table. The author maintains that equally good results could be obtained by extending the same practice to horses.

"As soon as experimental research work has been continued sufficiently long for it to be possible to determine the reciprocal relations of the dominance and recessiveness of many characters the breeder will be able to know beforehand the characters that will reappear in the hybrids and thus be in a position to obtain, at least to some extent, animals suited to satisfy the needs of the moment, or the requirement of any particular market."

For this reason the author is of opinion that "one of the great objects of the Stock-Breeding Research Laboratories should be the study of new methods of propagation based on scientifically conducted experiments, and applicable to practical stock-raising. The methods could either be applied directly, or after they have proved effective by testing them at special institutes under the direction of the agricultural authorities, and at stock-breeding centres."

745.—Advantages of Heavy Feeding of Milch Cows.—Ross, H. A., in *Circular No. 250. Illinois Agricultural College and the Creamery and Milk Plant monthly*, Vol. XI, No. 3, p. 35. Chicago, March, 1922.

The author states that the present prices of butter fat make it possible to dispose of farm produce at prices much above their present market value, when heavy feeding of cows is practised.

In Illinois, good cows are returning 85 cents per bushel of maize, $24 per ton for hay, and $9.50 per ton for silage, on the 35 per cent butter fat basis. These results have been obtained from the Illinois Agricultural Experiment Station and refer to records for 528 cows.

The average daily production amounted to 25 lb. of 4 per cent milk per cow for the six months, November to April, and a total of 92,095 lb. butter fat.

The feeds consumed during the period were as follows: *for the* 528 *cows:* 893,688 lb. concentrates + 831,954 lb. hay + 2,229,314 lb. silage; *per cow* respectively, 1,693 lb. + 1,576 lb. + 4,222 lb.; *per lb. of butter fat produced*, 9·7 lb. + 9·01 lb. + 24·2 lb.

These cows varied as to size, breed production and date of calving, but were typical of good milch cows found in Illinois.

If the concentrates in the ration consist of 2 parts maize and 1 part bran, and if the hay which is fed is a legume, the ration is well balanced and economical. With the bran costing $18 per ton cows like those studied, should give a return as follows: butter fat at 30 cents per pound per bushel of maize, $0.70; per ton of hay $20.50; per ton of silage, $8.00; butter fat at 35 cents per pound; respectively (maize, hay and silage) $0.85, $24.00 and $9.50; butter fat at 40 *cents* per lb., $0.95, $28.00 and $11.00.

Only the feed costs are included in this estimation; the incidental expenses of the dairy and the value of the skim milk are neglected.

Under existing conditions it is therefore evident that heavy feeding of milch cows is profitable; the increased grain ration is advisable as long as there is a corresponding increase in milk production, without a marked gain in body weight of the cow.

Where a legume hay is not available the ration maize + bran + silage + hay may be supplemented by linseed oil meal at the rate of 0·75 to 1 lb. per cow per day depending upon the amount of milk produced.

753.—Nutrient Requirements of Growing Chicks.—Mussehl, E. E., Halbersleben, D. A., and Sandsted, R. U., Nebraska Experiment Station, in *The Journal of Agricultural Research*, Vol. XVII, No. 3, pp. 139-150. Washington, Oct. 15, 1922.

Investigators in the field of nutrition have noted that chickens behave unlike rats or swine when limited to rations of one type, such as wheat or maize; this led to an enquiry into the values and deficiencies of the common feeding stuffs used for poultry and egg production.

The author carried out a large number of experiments and proved that maize is not a satisfactory food on which to rear chicks.

The chicks chosen for the experiments were selected with great care; all were of the same age, viz., ten days; of equal vigour and development, and each group of nine was apparently uniform in all respects. The chicks were weighed individually every seven days and the figures obtained set out in graphs, the curves being typical of each group.

The ration was given in two parts; one as a coarse, the other as a fine feed; with the fine, or mash feeds, were mixed the supplementary ingredients, the effects of which the authors wished to study.

The results showed that maize is deficient in essential qualities, and is not suitable for the complete nutrition of growing chicks which on this ration could not develop and ultimately died.

The addition of 5 per cent of mineral substances, such as bone-ash, sulphur, salts of calcium, sodium and iron, were of assistance and made possible a slow, but continuous growth. The inclusion of maize gluten was ineffective.

The addition of 15 per cent purified casein produced a marked improvement; it appeared that the casein supplied amino-acids, in which maize is deficient.

Supplementing the basal ration with other proteins, such as egg albumin and gelatin, lowered rather than raised the efficiency of the ration, and soya-bean meal was equally ineffective.

The addition of butter had no result; the fat contained substances which may have stimulated growth and so masked temporarily the lack of other essential accessories. There was a slight improvement in condition followed by a loss of weight until the chicks died.

The addition of green foods brought about a decided improvement; green wheat was given in abundance, and eaten by the chicks to the extent of about 5 per cent dry weight, of the whole ration. The helpful influence of green food may have been due to an improvement in the physical condition of the ration, and to a stimulating effect on the appetite.

Further experiments are now being carried out to ascertain the specific action of green foods.

With a ration formed of maize 65 parts, casein 15 parts, ash mixture 5 parts, starch 10 parts and unlimited green food, satisfactory growth to adult and egg-production stage was achieved, although the chickens

were confined in a small pen under unfavourable conditions.

756.—Problems of Incubation.—LAMSON, G. A. (Connecticut Agricultural College) in *The National Poultry Journal*, Vol. II, No. 82, pp. 396-397.

The factors influencing incubation are numerous; they may be divided into factors having to do: (1) with the collection, selection and care of eggs before placing them into the incubator; (2) with the handling and care of the eggs during incubation.

At the World's Poultry Congress held at the Hague in 1901 the author presented the following rules, as a result of the study of the physiological development of the embryo and practical experience.

The eggs should not be kept more than 16 days previous to incubation and the freshest eggs are best. The temperature should not exceed 90° F. Eggs should be kept lying on their sides in a dry place, as moisture tends to increase the possibility of infection through the shell. Recent investigation has shown that there is little or no value in turning the eggs previous to incubation. Eggs laid early in the season and kept at low temperatures take longer to incubate.

It is not possible to determine sterility, fertility or sex from the size or shape of the egg.

The use of large eggs for hatching is recommended on the ground that the size of the egg is a matter of heredity. Very large eggs however, as a rule do not hatch as well as medium sized eggs. Eggs with very porous or flaky shells with marked inequalities in thickness, do not hatch well. Very thin shelled eggs are likely to be broken during incubation. Excessively dirty eggs should not be used, and it may be advisable to wash eggs before incubation.

A thin muslin curtain tacked over the window will keep out direct sunlight and strong air currents.

Incubators should be set level in order to prevent warm places in the air chamber; incubators should be started 2 or 3 days before the eggs are placed in them.

To ensure the development of the embryo without delay, the temperature should be regulated at 104° or 105° F. before putting in the eggs, and then maintained at 103° F. If the period of incubation is lengthened the tendency is to decrease the numbers of eggs hatched. The regulation of the temperature is of great importance, especially during the first five days of incubation. It is doubtful if varying the temperature during the three weeks of incubation has any advantage over a uniform temperature of 103° F.

Tests made with about 10,000 eggs, using the calorimetric method in incubators with varying relative humidity, gave the following results, which indicate that there may be a wide variation in humidity without much danger.

EFFECT OF HUMIDITY ON INCUBATION

Relative humidity	Average loss of weight per egg		Per cent of fertile eggs hatched
Per cent	gm.	Per cent	
70–80	3·03	5·3	45·5
60–70	4·96	8·7	62·1
50–60	5·61	9·8	69·3
40–50	5·82	10·2	68 6
30–40	6·57	11·5	68·6
20–30	8·22	14·5	60·6
15–20	9·94	14·7	48·0

The method of incubation in rooms above a cellar has proved difficult owing to the fact that the conditions of humidity are very different from those in most rooms below ground level.

The practice of cooling eggs during incubation is not recommended. It is incorrect to say that cooling affects the vitality of chickens; out of 500 chickens, 34 had died at the end of 4 weeks, 20 of which had been cooled during the incubation and 14 had not been cooled.

Ventilation may vary to a fairly large extent without any deleterious effect; only when the carbon dioxide reaches 15 0/00 is the danger noticeable. If the ordinary incubator is well ventilated the question of carbon dioxide is negligible.

Eggs should be turned from the third day of incubation and at frequent intervals until at the point of hatching. It has been found that eggs turned at least 5 times during each 24 hours have given somewhat better results than those turned twice, and the latter showed an improvement on those turned only once. The common practice of turning each morning and evening is advisable from the economic standpoint. When turning it is advisable also to change the position of the eggs on the tray, thus equalizing the effects of minor variations in temperature that may occur in the incubator.

The individuality of the hen has a marked influence on the vitality of the embryo; out of 1,003 eggs laid by 18 hens, only 7 were sterile, whilst nearly 600 from the same number of eggs from other sources were sterile. Hatching has varied from 90 per cent from some hens to 30 per cent with others. The choice of the mother hen is therefore probably the most important feature in incubation. There is less variation in vitality with the embryos of male-birds.

At the present time, the all important question is how to increase the vigour and strength transmitted from the hen to the embryo by means of wise selection of mother hens, proper feeding, good housing, exercise, etc.

620.—The Treatment of Contagious Entero-Hepatitis in Turkeys With Ipecacuanha.—BISSET, N., in *The National Poultry Journal*, Vol. II, No. 92, P. 534. Westminster, March 1, 1922.

The author reports the good results obtained in treating a flock of turkeys suffering from contagious entero-hepatitis, with ipecacuanha as advised by Dr. H. M. WEGEFORTH and Dr. Paul WEGEFORTH of San Diego (California). The healthy birds are at once separated from the diseased birds, the which are given 10 drops per head of fluid extract of ipecacuanha, 3 times a day for 3 days, then twice a day for 3 more days, and finally once a day for 3 days. Turkeys which were in good health, but had been in contact with infected birds, were given powdered ipecucuanha, the dose being one teaspoonful for every twenty turkeys, given in their food, until the flock showed no further symptoms of disease.

The treatment was completed by a thorough cleansing and disinfection of the poultry-house.

623.—The Dryden Method of Choosing Laying Hens.—*The National Poultry Journal*, Vol. II, **No. 56,** p. 42. Westminster, 1921.

Prof. JAMES DRYDEN has devised a method for the classification of hens as good, fair and bad layers. This method is based on the egg production ascertained by the use of trap-nets and by the study of the characters of the fowl.

Hens that cease laying and moult in July-August are not good layers, the same may be said of pullets laying few eggs their first year; such birds will not improve later and are therefore better eliminated.

Should nest-traps not be available, omission of laying is shown by: (1) shrivelling of the comb, wattles and auricles; (2) the narrow pelvis; (3) the contraction or induration of the abdomen; (4) in breeds having naturally yellow skin and legs, like the Leghorns and Plymouth Rocks, the brilliant hue of the legs and beak show that the hen has not laid for some weeks; (5) moulting.

In July, August and the beginning of September all fowls should be weeded out that: (a) are in an advanced stage of moulting, the comb and wattles being shrivelled; (b) have a contracted abdomen, or dry and wrinkled cloaca; (c) have yellow legs and beak. As a rule, symptom *a* is sufficient guide, but it is sometimes necessary to find it combined with *b* in order to be quite certain; *c* alone is not enough and this symptom must be associated with either *a* or *b*.

By adopting this method it is possible to reduce by 20 per cent a flock of average fowls without lessening the egg production. The better the feeding and general conditions, the more certain are the results obtained, for scarcity of food or a change in diet or environment may cause laying to cease, and make even a good layer begin to moult.

If it is desired to make a still more rigorous selection and to keep only fowls able to lay 200 eggs a year, hens must be chosen from October 15 to November 15, which have not completed moulting and possess (1) bright red wattles and comb, and quick eyes; (2) very broad pelvic bones, and elastic caruncle and abdomen; (3) pale legs, beak and cloaca, if the breed is one in which the skin and legs are naturally yellow. The present higher price of food renders the rigorous selection of the best laying hens more necessary and more profitable than before the war.

RURAL ECONOMICS

763.—Cost of Producing Wheat on 481 Farms in the States of North and South Dakota, Minnesota, Kansas, Nebraska and Missouri for the Crop Year 1919.—COOPER, M. R. and WASHBURN, R. S., in *United States Department of Agriculture, Bulletin* No. 943. Contribution from the office of Farm Management and Farm Economics, pp. 1-59, figs. 9. Washington, D.C., 1921.

The authors state that to be of real significance, cost figures must be presented in terms of the ranges that exist in the final cost per unit of production and in the various elements of cost. The variations in the cost per unit of production in any representative farming area are so marked that they should be considered in any case where cost figures are concerned. From the presentation of the range of costs of farm products, it would appear that usually from 40 to 50 per cent of the production involves expenditure above the average. It follows that the cost that will cover the "bulk" of the production of a given product is the figure that approximates to what the price should be to maintain the industry. This consideration has led to the consideration of the "bulk-line" theory which has recently assumed an important place in the discussion of the relation of production costs to price. The "bulk-line" theory is a modification and an attempt at practical application of the "marginal cost" or "greatest-cost" theory of the relations of cost and price. In practice, the "bulk-line" has sometimes to be drawn to include 85 per cent of the production, but this is merely a tentative and more or less arbitrary figure.

In reality the position of the "bulk-line" varies with different commodities and from time to time, according to alertness with which farmers adjust their production to market conditions. The "bulk-line" cost corresponds to the long-period average

price which is essential, one year with another, to stimulate the production of the amount of product which the market demands. What this "bulk-line" cost will be depends upon a number of factors, including the rate the farmer must pay for land, labour and capital, and the standard of living which farmers, as a class, insist upon if they are to remain on the farm.

The purpose of the present bulletin is to give a statement of facts concerning the cost of wheat production for the area and season covered by the survey; United States western and northern plains and the crop year 1919.

Tabulated cost data were obtained from 481 records, of which 197 were made in five representative counties of the principal spring-wheat states, North and South Dakota and Minnesota, and 284 in nine counties in Kansas, Missouri and Nebraska, important winter-wheat states, and furnish the basis of this analysis of the average cost and variation in cost on individual farms and groups of farms in each area visited, as well as the more important reasons for the great variations in cost per acre and per bushel on individual farms. A total area of 43,940 acres sown with winter wheat, yielding 635,124 bushels and a total area of 44,218 acres seeded for spring wheat, with a total production of 362,047 bushels for the crop year 1919, were involved. The results are summarized as follows:—

Cost per acre: Spring wheat, $12.98 to $47.84; average, $22.40; winter wheat, $10.55 to $50.23; average, $27.80.

Cost per bushel: Spring wheat, $1.15 to $14.38; average, $2.65. Winter wheat, $0.96 to $8.24, average $1.87.

Yield: Spring wheat, 20·8 bushels per acre to less than one bushel; average, 8·4. Winter wheat, 30 bushels per acre to 2·2 average, 15.19.

The average yield of spring wheat was 9 bushels per acre in the United States as a whole in the same year, 1919, and the average yield for all winter-wheat in 1919 was 14·7 bushels per acre. The largest number of spring-wheat farms fell within the group having a yield of from 5 to 10 bushels per acre, while the largest number in the winter-wheat districts were included in the group having a yield of from 15 to 20 bushels.

The difference between the gross cost and the sum of credits for pasture and any straw utilized on the farm is taken to be the net cost of producing wheat. The average cost expense of each item was computed on a basis obtained by dividing the total cost of each item by the total wheat acreage. An analysis of the total cost for spring and winter wheat shows that labour accounts for about 32 to 35 per cent of the total cost of production, threshing about 8 per cent, materials from 10 to 17 per cent, land rent from 24 to 30 per cent and other costs from 17 to 19 per cent. The difference in cost per bushel of producing spring and winter wheat is due to a lack of relation between the cost of producing an acre of wheat and the yield obtained, the cost per acre of winter wheat being 24 per cent greater than for spring wheat. In the spring wheat area about 33 per cent of the production was on the farms having cost above the average; in the winter wheat area, about 40 per cent of the production was on farms having costs above the average.

Summaries of costs by districts, range in cost per acre by counties, net cost per bushel, variations in items of cost, area of farms according to cost per bushel by counties, cumulative percentage of acreage grown at various bushel costs, cumulative percentage of total production, and individual costs per acre are tabulated and discussed.

AGRICULTURAL INDUSTRIES

498.—Variations in the Percentage of Fat in Successive Samples of Cows Milk.— Ragsdale, A. C., Brody, S., and Turner, C. W., in *Journal of Dairy Science*, Vol. X, No. 5, pp. 448-450. Baltimore, September, 1921.

The fact that successive samples of milk drawn from a cow gradually increase in fat content, has long been known and was formerly explained by supposing that the fat being lighter rose to the top of the milk cistern and ducts.

This gravity theory was however discarded as a result of the observations of Heidenhain, who found that the difference in the volume of the udder before and after the evacuation of milk is much below the volume of milk given by a cow during one milking, and consequently inferred that a large part of the milk is secreted during the process of milking. The authors describe their own experience which may contribute to an explanation of the phenomenon. The right front quarter of a Jersey cow producing 20 pounds of milk per day was milked under the following conditions:

AMOUNT OF FAT IN SUCCESSIVE FRACTIONS OF MILK

Sample No.	Cow			Cylinder	
	Upon coming into barn	After standing 2 hours	Standing 2 hours and manipulation	After standing 1½ hours	After standing 3 hours
	Per cent	Per cent	Per cent	Per cent	Per cent
1	3·1	1·4	6·3	4·4	1·6
2	3·2	1·5	6·1	5·4	2·7
3	4·7	1·9	6·4	5·7	3·6
4	5·4	3·0	6·5	5·8	4·2
5	5·9	3·4	6·5	5·9	4·9
6	6·6	4·1	6·8	6·0	5·4
7	6·9	4·8	7·2	6·0	5·9
8	6·5	7·8	7·5	6·3	6·8
9	6·8	11·0 (about)	8·2	6·7	12·0

(1) Immediately on coming into the barn from the pasture; (2) after standing quietly in the barn for two hours; (3) after standing in the barn for two hours followed by a thorough massaging and manipulation of the udder for a few minutes for the purpose of mixing the milk within if possible. The milk in each case was milked into a 100 cc. cylinder and fat determined in each of the 100 cc. fractions. For comparison determinations were made of the variations of fat in successive 100 cc. of milk drawn from 900 cc. cylinder of the usual dimensions after standing respectively for 1½ and 3 hours. The results given in the table show that, within given limits, the longer the cow stands quietly the greater the variation in the fat content of the successive fractions of the milk. The curves of variation in the cylinder and udder are strikingly similar.

502.—Connection Between the Number of the Bacteria in the Milk and the Quality of the Cheese Obtained.—HUCKER, G. J., in *New York Agricultural Experiment station, Geneva, Bulletin No. 486*, pp. 19. Geneva, New York, 1922.

This paper is the first of a series on the bacteriology and ripening of cheeses and the connection between this ripening and the bacterial flora of the milk. The data upon which this study is based were collected during the winter of 1920 in a cheese-factory near Philadelphia, where whole milk Cheddar cheeses of the "Young American" type were manufactured. The counts of the bacteria present in the milk were made on samples taken from the milk supplied by 25 members of the cheese factory and on samples taken from the cauldron, in some cases the number of bacteria was estimated from the acidity.

It was found that there is no connection between the bacterial content of the milk and number of marks accredited to ripe cheese, although milk with the maximum of micro-organisms (12 to 14 million per cc.) tends to make better cheeses of a constant type, whereas milk with few bacteria produces cheeses of variable quality.

The number of bacteria present in the milk does not appear to have any effect upon the amount of cheese produced.

The character of the species of bacteria in the milk intended for cheese-making is of much greater importance than their number, hence milk intended for the cheese factory should not be judged from the bacteriological standpoint in the same manner as milk to be drunk in its natural condition.

PLANT DISEASES

872.—Decree of July 13, 1922, Prohibiting the Entry Into France and the Transit of Potatoes and Their Leaves and Refuse Coming From the United States and Canada.—*Journal Officiel de la Republique Francaise*, Year LIV, No. 189, p. 7418.

Art. I.—The entry and transit in France of potatoes, and their leaves and refuse coming directly or indirectly from the United States and Canada, countries where the existence of *Doryphora decemlineata* of Colorado has been ascertained, are prohibited. This prohibition also applies to boxes, barrels, sacks or other packing in use or having been used in the transport of the above-mentioned produce.

Art. II.—The prohibition contained in Art. I above will be applicable also to consignments of fresh fruits and vegetables other than potatoes and their leaves and refuse, as well as to material used in their transport and packing, when the presence of *Dor. decemlineata* has been ascertained on such consignments.

To give effect to this measure, the said consignments will be specifically examined for the purpose on arrival in France.

509.—Sulphate of Iron and Perchloride of Iron in the Treatment of Chlorosis of the Vine.—ERRICHELLI, E., in *La Propaganda Agricola*, Series II, Year XIII, No. 15, pp. 206-209. Bari, 1921.

In treating "chlorosis" of the vine with sulphate of iron it is necessary according to the author, to insure that this salt exerts

a rather prolonged action on the root system of the host plant. For this reason, instead of applying a solution of iron sulphate to the soil around the diseased vine, it is better to use it in the form of powder which should be well mixed with soil and spread around the vine-stock at a distance of 20 to 24 inches. The soil is then lightly watered for some days which causes the salt to dissolve gradually and provide the roots with a constant supply of weak solution, which will not become too concentrated. For this treatment 250 to 300 gm. of sulphate iron are sufficient.

Better experimental results, as regards efficacy, rapidity and economy, were obtained by the author in the treatment of chlorosis with perchloride of iron than with sulphate of iron if very dilute solutions were employed.

The author advises that perchloride of iron be prepared and applied in the following manner.

A 2 per cent solution is made by adding 10 to 12 gm. of perchloride of iron to 5 or 6 litres of water. This mixture is poured into a circular trench dug around the vine-stock at a distance of from 20 to 24 inches in order to get as near as possible to the roots and the trench is afterwards filled in with soil.

By the adoption of this method severely infected vines have been permanently cured, whereas others which were treated with sulphate of iron and appeared to have recovered became chlorotic again after some time had elapsed.

522.- **On the Etiology of the Potato Disease Known as Tip-Burn, in the United States.** —EYER, J. R., in *Science*, New Series, Vol. IV, No. 1416, pp. 150-151. Utica, N.Y., February 17, 1922.

Researches have been made of recent years at the Experimental Station of Pennsylvania State College with the object of determining the etiology and specific cause of the potato disease called tip-burn due to the attack of *Empoasca mali*.

The experiments were carried out in the form of a series of inoculations with aqueous and alcoholic extracts of the Rhynchote and other insects living at the expense of the potato. The inoculated plants were placed in special cages and exposed to sunlight of different degrees of intensity in order to determine how far sunlight influences the development of the disease.

The results obtained led to the following conclusions:

(1) Tip-burn of the potato can be induced by means of an extract obtained by maceration of the nymphs or adult forms of *E. mali* and is transmissible by direct inoculation; this indicates the presence of some specific substance, either inherent or of external origin and transmitted by the Rhynchote which is the actual cause of the disease.

(2) The active principle of this substance is more energetic in the nymph stage of the Rhynchote.

(3) The specific substance is present in the tissues of the diseased leaf after inoculation with the Rhynchote extract and can be transmitted by reinoculation to healthy plants.

(4) This substance is of a definite nature and the disease cannot be induced by inoculation with extracts of insects other than *E. mali*. or by mechanical injury.

(5) Sunlight plays an important part in the progress of tipburn after it has once begun, but the absence of sunlight does not prevent its appearance.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

362.—**Fleas and the Methods of Their Control.**—I. BISHOPP, F. C., Fleas and Their Control, in *Farmers' Bulletin 897, United States Department of Agriculture*, 11 pp. Washington, 1921. II. DELANSE, P., Au sujet d'un piège à puces, in *Bulletin de la Société de Pathologie exotique*, Vol. XV, No. 1, pp. 39-41. Paris, January 11, 1922.

370.—**Studies on the Reduced Yield of the Chief Farm Crops, Especially as Caused by Adverse Weather Conditions in the United States.**—VALGREN, V. N., in *U.S. Department of Agriculture, Bulletin No. 1043, Office of Farm Management Farm Economics*, pp. 1-29. Washington, January, 1922.

376.—**Preparation of Soil Solution.**—GREAVES. J. E., and HIRST, C. T., in *The Journal of Agricultural and Engineering Chemistry*, Vol. XIV, No. 3, pp. 224-226, bibliography of 23 works. Washington, March 1, 1922.

452.—**Study on Horse Breeding in the United States.**—HARPER, M. W., in *Cornell University Agricultural Experiment Station, Bulletin No. 403*, 49 pp. Ithaca, New York, 1921.

455.—**New Methods of Judging Cattle.**—KOPPE, Das ostfriesische und provinzialsachsische Korverfahren; II. CORNELIUS, Das oldenburgische Korverfahren; III. Das Jeverlander Korverfahren; in *Deutsche landwirtschaftliche Tierzucht*, Year XXV, No. 17, pp. 170-171. Hanover, April 1921. IV. GOWEN, J. W., Studies on conformation in relation to milk-producing capacity in cattle, in *Journal of Dairy Science*, Vol. IV, No. 5, pp. 359-374. Baltimore, September 1921. V. MARCQ, J., (Institut Agronomique de Gembloux) and MAHY, M., Des modes d'appreciation du bétail dans les concours et du type idéal bovin à rechercher en Belgique, in *Annales de Médecine Vétérinaire*, Year XLVI, Nos. 8-9, pp. 337-364. Ixelles-Brussels, August-September, 1921. VI. COLOMBE, M., Appréciation des qualités beurrières et laitières chez les vaches, in *Journal d'Agriculture Pratique*, Year LXXXV, No. 44, pp. 377-379, and No. 45, pp. 391-393. Paris, November, 1921.

459.—**Lamb-Fattening Experiments in the United States.**—I. HAMMOND, J. W., Green forage crops and corn for fattening lambs, in *Bulletin of the Ohio Agricultural Experiment Station, No. 340*, pp. 35-99. Tables 28, figs. 16. Wooster, Ohio, 1920.—II. PATERSON, A. M., and WINCHESTER, N. B., Lamb Feeding Investigations, 1919-1920, in *Agricultural Experiment Station, Kansas State Agricultural College, Manhattan, Kansas, Circular 88*, pp. 6, fig. I. Topeka, 1921.

490.—**Cost of Milk Production in Some of the States of North America.**—I. COMBS, S., and BAIN, J. B., A study of the factors involved in producing milk in North Carolina, in *North Carolina Department of Agriculture Bulletin*, Vol. 41, No. 5, pp. 30. Raleigh, 1920. II. BAIN, J. B., and POSSON, R. J., Requirements and Cost of producing market milk in Northwestern Indiana, in *United States Department of Agriculture Bulletin No. 858*, pp. 31. Washington, 1920. III. BAIN, J. B., and BRAUN, G. E., Unit Requirement for Producing Milk in Western Washington, *Ib. Bulletin No. 919*, pp. 19, 1920. IV. BAIN, J. B., and POSSON, R. J., Unit requirements for Producing Market Milk in Vermont, *Ib. Bulletin*, No. 923, pp. 18, tabl. 12, 1921. V. BAIN, J. B., BRAUN, G. E. and WOOD, W. D., Unit Requirements for Producing Market Milk in Southeastern Louisiana, *Ib. Bulletin*, No. 955, 1921.

547.—**Experiments With Potash Fertilizers in the United States.**—I. SMITH, R. S. Some effects of potassium salts on soils, in *Cornell University Agricultural Experiment Station, Memoir 35*, pp. 571-605. biblio. Ithaca, N.Y., 1920. II. PARR, S. W., and AUSTIN, M. M., Potash Shales of Illinois; KREY, F., Geology Distribution, and Occurrence of the Potash-Bearing Shale of Union County; STEWART, R., Finely-Ground Shale as a source of potash for soil improvement, in *University of Illinois Agricultural Experiment Station Bulletin, No. 22*, pp. 227-252. Urbana, Ill. 1921.

551.—**Methods of Colloidal Chemistry in Plant Physiology, Sensitiveness of Lupins to Alkaline Earth Metals.**—BOAS, F. and MERKENSCHLAGER, F., in *Centralblatt fur Bacteriologie*, II. Abb., Vol. 55, Nos. 21-24, pp. 508-214. Jena, 28th Feb., 1922.

563.—**Means of Obtaining, by Suitable Crossing, Varieties of Grapes Without Pips.**—STOUT, A. B., in *New York Agricultural Experiment Station*, Geneva, N.Y., Technical Bulletin No. 82, pp. 1-16. Plates i-vii. Geneva, N.Y., January 1921.

603.—**Thirty Year's Experimental Stock Breeding in Utah.**—HARRIS, F. S., and BUTT, N. J., in *Utah Agricultural Experiment Station, Circular No. 46*, 64 pp. Loban, Utah, 1921.

637.—**Investigations on Milking Machines: Their Efficiency, Advantages in Labour Saving, and Their Sterilization.**—WOLL, F. W., Investigations with milking machines, in *California University Agricultural Experiment Station*, Bulletin 311, pp. 31-34, 3 fig. Berkeley, 1919.—II. RIDDEL, F. T., Machine *versus* Hand Milking in *Michigan Agricultural Experiment Station, Quarterly Bulletin*, v. 1, No. 4, pp. 163-164. East Lansing, 1919.—III. BREED, R. S., Methods of Caring for Milking Machines Tubes, in *Journal of Dairy Science*, v. V. No. 1, pp. 102-109, bibliography of 15 works. Baltimore, Jan. 1922.

643.—**Manufacture of Cheese of the Roquefort Type With Cows Milk in the United States.**—MATHESON, K. J., in *United States Department of Agriculture, Bulletin 970*, pp. 28, figs. 11. Washington, 1921.

685.—**The National Agricultural Conference in the United States.**—*Journal of Farm Economics*, Vol. IV, N. 1, p. 61-63. Lancaster, Pa., Jan. 1922.

686.—**The Smithfield Club Show in London and Its Lessons.**—I. *Live Stock Journal*, Vol. XCIV, No. 248, pp. 583-593. London, December 9, 1921. II. VOITELLIER, Ch. and GRAN, A., in *Revue de Zootechnie*, No. 4, pp. 299-321. Paris, January 1922.

690.—**Depth for Sowing Grass and Clover Seed.**—WILLIAMS, R. D., in *The Journal of the Ministry of Agriculture*, Vol. XXIX, No. 1, pp. 53-60 and No. 2, pp. 132-137. London, April-May, 1922.

728.—**Poisoning of Cattle by the Prussic Acid in Sorghums.**—VINALL, H. N., in *Journal of the American Society of Agronomy*, Vol. 13, Nos. 6-7, pp. 267-280. Bibliography of 22 works. Lancaster, Pa., and Washington, D.C., Oct. 15, 1921.

737.—**The Mannitol-Producing Organisms in Silage.**—PLAISANCE, G. P., and HAMMER, B. W., in *Journal of Bacteriology*, Vol. 6, No. 5, pp. 431-433, bibliography of 7 works. Baltimore, Sept. 1921.

742.—**The Proportions of the Trotter.**—VAN MELDERT, L., in *Annales de Gembloux*, Year 25, Book 6, pp. 198-208. Brussels, June 1922.

751.—**Effect of Rationing on the Development of Pigs.**—SWANSON, C. O., in *Journal of Agricultural Research*, Vol. XXI, No. 5, pp. 270-341. Bibliography of 11 works. Washington, D.C., June, 1921.

758.—**Poultry Feeding Methods Employed by Experiment Stations in the United States.**—ATWOOD, H. in *The National Poultry Journal*, Vol. II, No. 56, pp. 41-42. London, 1921.

764.—**The Cost of Production of Wheat, Beet, Potatoes and Milk in France.**—GIRARD, H., in *Bulletin de la Société des Agriculteurs de France, Supplément du Bulletin d'Avril 1922, Comptes-rendus de l'Assemblée Générale de 1922*, Section 2, pp. 39-45. Paris, 1922.

774.—**Dairy Products Investigation. Projects Carried on by the Agricultural Experiment Stations in the United States.**—POTTS, R. C., in *Journal of Dairy Science*, Vol. IV, No. 5, pp. 416-428. Baltimore, 1921.

776.—**The Preservation of Forage by Means of Electric Current.**—*Rapport présenté par l'Administration centrale des Etablissements fédéraux d'essais et d'analyses agricoles de Liebefeld près Berne.* April 4, 1922, pp. 1-8.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief indication of the contents of the more important articles in the November and December numbers of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

New Agricultural Organizations in Austria.—6 pages. After the war there appeared in Austria a tendency to the creation of associations representing the agricultural profession in the separate provinces of the confederation. The new organizations discussed in this article are: the vocational agricultural organizations in the Tyrol; the Chamber of Agriculture of Lower Austria; and The Chamber of Agriculture of Styria.

War and Post-War Rural Credit Measures in the United States—12 pages. The subject is discussed under four heads: The War Finance Corporation, The Federal Loan System, seed grain loans, and miscellaneous measures, including rural credit measures taken by certain of the States.

The National Committee for the Embellishment of Rural Life in Belgium.—6 pages. The National Committee owes its origin to the very general interest shown in the agricultural section of the "Modern Village" exhibited at the World International Exhibition held at Ghent in 1913. The article describes the success achieved by the Committee, which hopes to put a check on rural exodus.

Other articles in the November number are: The First Co-operative Grain Elevators in Algeria; Co-operative Forestry Societies in Roumania; The Assessment of Losses Caused by Forest Fires in France; The Maintenance of the Agricultural Labour Supply in Ireland During the War; The Agricultural, Social and Financial Policy of the "Opera Nazionale Per I Combattenti" of Italy.

Articles in the December number of the Institute Economic Bulletin are: The Saragossa Farmers' Association; The Enquiry of the Swiss Peasants' Secretariate into Agricultural Association and Co-operation in 1920; The Maintenance of The Agricultural Labour Supply in Germany during the War (55 pages); Land Policy in Russia.

AGRICULTURAL STATISTICS

FOREIGN CROP CONDITIONS

(April 18th, 1923)

Conditions in February.—Almost throughout Europe, February was characterized by heavy rains and mild temperature. No frost damage was reported except in western Poland. Excessive moisture caused a yellowing of plants in some districts of France and England, but, generally speaking, the month was favourable for winter crops, and their condition at the beginning of March was in the main a good one. The rains caused such saturation of the soil as to stop the preparatory work for spring sowing, so that in most countries sowing was not begun when March set in. In North Africa the month was propitious for winter crops, and they showed good promise.

Conditions generally in March.—In the first part of the month conditions in Europe were fair to good except that there was too much rain in the western countries. By the middle of the month the weather was much better and the crops generally satisfactory. In the last part of the month conditions continued to improve.

United Kingdom.—The weather was generally fine in the last part of March. Work on the land, which had fallen somewhat behind on account of the rains earlier in the season, had made a good recovery. Winter wheat and oats were of excellent promise on the first of April.

France.—The weather was fine during the last half of March. Spring sowing proceeded with great activity. There is a ten per cent increase in the winter wheat acreage. Soil conditions are favourable.

Germany.—Weather conditions improved in March. Spring work was behind, but winter crops were reported satisfactory.

Italy.—Spring sowing was proceeding amid favourable surroundings. Winter crops were in good condition.

Spain.—Winter crops were considerably damaged by drought, but their condition was improved by rains in the last week of March.

Hungary.—Wet weather delayed spring cultivation, but the condition of winter crops was satisfactory.

North Africa.—The crop outlook was generally satisfactory at the beginning of April. Drought had retarded the crops in some districts.

Australia.—The moisture supply has not equalled expectations. There is great need for more rain in order to put the soil in a satisfactory condition for seeding.

Argentina.—Soil conditions are favourable for the seeding of the new crops.

AREAS SOWN TO WINTER WHEAT AND RYE

Countries	Wheat			Rye		
	1923	1922	1917-21	1923	1922	1917-21
	Acres	Acres	Acres	Acres	Acres	Acres
Belgium	328,000	307,000	298,000	475,000	540,000	535,000
Bulgaria	2,145,000	2,189,000	....	401,000	418,000	....
Spain	10,175,000	9,927,000	10,134,000	1,701,000	1,737,000	1,994,000
Finland	22,000	22,000	18,000	578,000	578,000	592,000
France	12,989,000	11,862,000	11,906,000	2,149,000	2,054,000	2,128,000
Italy	11,614,000	11,488,000	11,071,000	321,000	321,000	315,000
Poland	2,362,000	2,408,000	....	11,476,000	11,163,000	....
Roumania	4,488,000	4,970,000	4,744,000	456,000	482,000	667,000
Jugo-Slavia	3,602,000	3,383,000	....	....	....	....
Czecho-Slovakia	1,286,000	1,367,000	1,409,000	2,054,000	2,137,000	2,211,000
Canada	938,000	995,000	796,000	....	....	....
United States	46,069,000	47,611,000	44,814,000	5,508,000	6,210,000	5,128,000
India	29,511,000	27,920,000	27,867,000	....	....	....
Algeria	3,015,000	3,015,000	....	....	....	....
Tunis	1,112,000	1,112,000	....	....	....	....
Totals	129,656,000	128,576,000	....	....	....	....

THE WHEAT CROP OF INDIA

A cablegram from the International Institute of Agriculture states that the newly harvested wheat crop of India is 425,000,000 bushels compared with 366,000,000 last year, and 344,600,000 the average of the five years 1916-20. This crop was harvested on 29,511,000 acres compared with 28,234,000 last year. It is a record crop for India. In the decade 1899 to 1908 the average area sown to wheat was 25,000,000 acres, and the average production 275,000,000 bushels.

The condition of the cereal crops in Europe and North Africa on April 1st is reported by the Institute as generally good.

The final estimate of the 1922 production of wheat in France is 243,240,000 bushels against 323,000,000 in 1921. Previous estimates gave the 1922 crop as 235,000,000 bushels.

THE UNITED STATES APRIL CROP REPORT

The 1923 winter wheat crop is estimated by the U.S. Department of Agriculture at 572,317,000 bushels, the smallest crop since 1918, and 17,537,000 bushels less than the average production for the past 10 years. The forecast is based on conditions prevailing April 1st and upon the assumption of average abandonment of acreage through the winter and average influences from now until harvest.

No estimate was made of the abandoned acreage, which will be indicated in the May crop report, but the Department says that abandonment promises to be heavy, although irregular, from Ohio westward to Kansas and Nebraska.

Owing to the extensive drouth or scanty rainfall last fall and winter in many sections, much wheat failed to germinate or, barely germinating, perished from the rigours of winter. In the plains area, extending from western Nebraska through western Kansas into the panhandle region of Oklahoma and Texas, conditions are extremely poor, ranging from 50 per cent downward to complete failure. These conditions extend with lessening severity over the adjacent half of Nebraska, the western half of Kansas, practically all of the Texas panhandle, eastern New Mexico, eastern Colorado, and southwestern Wyoming, in all of which territory the condition is below 65 per cent.

The area sown to winter wheat last fall was about 1,500,000 acres less than sown in the fall of 1921, the total having been 46,069,000 acres for this year's crop, compared with 47,611,000 last year. The abandoned acreage last year amounted to almost 5,500,000 acres, and indications are that it will be more extensive this year.

This year's rye production was forecast at 75,784,000 bushels, which is almost 20,000,000 less than last year's crop, the third largest ever grown

THE WORLD'S CORN CROP COMPARED WITH PRE-WAR FIGURES

The International Institute of Agriculture reports that in Europe, not taking into consideration present Russian territory—where this crop is however of limited importance—the diminution in the yield for 1922 has been, in proportion, greater for corn than for any other cereal crop. In fact, the European yield in 1922 was estimated at equal to but 62 per cent of the average for the period 1909-1913. Even when compared with 1921, the yield in 1922 shows a decrease.

Also, in the United States, which furnish 75 per cent of the world's total production of corn, the yield in 1922 was below (by about 6 per cent) that of 1921, although showing an increase of 7 per cent over the pre-war average. The results indicated above may be seen from the following figures showing the aggregate productions of Europe and North America.

(Production In Thousand Bushels)

Countries	1922	1921	Average 1909-1913
European countries	347,142	397,320	559,106
United States and Canada	2,904,510	3,083,473	2,725,529
Totals	3,251,652	3,480,793	3,284,635

For a group of countries, therefore, which supply about 90 per cent of the world's total corn production, the yield in 1922 was 7 per cent below that of 1921, and 1 per cent below the average for the pre-war period 1909-1913.

Argentina, one of the world's large corn-producing countries, does not figure in the above table, as the harvest in this country has only just begun. The yield appears likely to be considerably below that of last year in spite of the increase in the area cultivated.

The areas under crop and the yields pei acre in the year 1922, as compared with those of 1921 and the averages for the five-year period immediately precedent to the war, are indicated, in the following table, for Europe and for North America.

AREAS, AND YIELDS PER ACRE

Countries	Areas (in thousand acres)			Yields (in bushels per acre)		
	1922	1921	Average 1909-1913	1922	1921	Average 1909-1913
European	22,975·2	23,188·7	24,250·5	15,2	17·1	23·0
United States and Canada	102,748·9	104,039·3	104,540·7	28·2	29·6	26·1
Totals and averages	125,724·1	127,228·0	128,791·2	25·9	27·3	25·5

For Europe, a certain decrease is to be noted in the area cultivated in 1922, together with a large diminution in the yield per acre; whilst in North America the area cultivated has remained very much the same as compared with the 1909-1913 average, and the yield per acre shows a considerable increase.

IMPORTS AND EXPORTS OF WHEAT AND FLOUR

(Flour reduced to equivalent quantities of wheat)

Countries	January		Six months (August 1st to January 31st)	
	1923	1922	1922-23	1921-22
	Bushels	Bushels	Bushels	Bushels
Exports—				
Hungary	282,000	1,778,000	2,904,000	6,270,000
Roumania	126,000	76,000	1,240,000	2,478,000
Canada	14,354,000	8,946,000	190,447,000	118,788,000
United States	12,519,000	14,982,000	142,408,000	180,728,000
Argentina	12,583,000	9,687,000	45,644,000	18,678,000
India	2,618,000	252,000	7,454,000	1,655,000
Australia	8,818,000	13,647,000	17,214,000	52,146,000
Algeria	....	183,000	577,000	4,685,000
Tunis	12,000	58,000	150,000	1,623,000
Other countries	30,000	230,000	1,361,000	1,938,000
Total exports	51,342,000(*a*)	49,839,000	408,822,000 (*a*)	388,989,000
Imports—				
Germany	2,209,000	3,081,000	25,197,000	44,433,000
Austria	....	1,654,000	5,834,000	10,768,000
Belgium	3,402,000	6,173,000	20,488,000	26,885,000
Denmark	579,000	157,000	2,958,000	2,514,000
Finland	315,000	131,000	2,323,000	1,371,000
France	....	408,000	20,302,000(*c*)	15,572,000
Great Britain and Ireland	21,335,000	11,682,000	112,764,000	102,776,000
Greece	1,837,000	989,000	7,620,000	6,120,000
Italy	9,318,000	12,063,000	47,171,000	56,316,000
Norway	561,000	573,000	3,860,000	3,508,000
Netherlands	2,492,000	1,331,000	14,881,000	12,080,000
Poland	80,000	21,000	218,000	420,000
Sweden	396,000	229,000	4,270,000	2,769,000
Switzerland	....	867,000	6,607,000	8,568,000
Czecho-Slovakia	708,000	706,000	3,808,000	7,144,000
Japan	574,000	2,416,000	5,192,000	10,205,000
Egypt	751,000	313,000	3,213,000	4,110,000
Other countries	199,000	129,000	1,198,000	1,291,000
Total imports	44,756,000 (*b*)	42,923,000	255,168,000 (*b*)	316,850,000

(*a*) Not including Algeria. (*b*) Not including Austria, France and Switzerland. (*c*) Five months only.

INDEX NUMBERS OF THE PRICE OF WHEAT

Dates	Exporting Markets				Importing Markets					
	Canada WINNIPEG — No. 1 Manitoba	*United States* CHICAGO — No. 2 Winter	*India* KARACHI — Karachi White	*Argentina* BUEN. AIRES — Barletta	*Germany* BERLIN — Home grown	*Belgium* ANTWERP — Home grown (Markischer)	*France* PARIS — Home grown	*Great Britain* LONDON — Home grown	*Italy* MILAN — Home grown soft	*Netherlands* ROTTERDAM — Home grown
Average 1913	100	100	100	100	100	100	100	100	100	100
14 March 1913	97·4	98·3	108·0	91·3	99	99·7	101·1	97·9	106·3	84·9
10 " 1922	158·5	145·7	nq.	159·0	6,611	320·7	254·5	157·3	416·4	140·2
5 January 1923	121·7	132·1	139·9	137·0	167,924	343·4	300·7	116·7	395·0	113·8
12 " 1923	123·6	133·8	141·6	136·4	195,073	353·5	302·5	118·7	391·5	113·8
19 " 1923	124·3	133·5	139·9	138·2	367,019	363·6	311·5	122·9	391·5	117·8
26 " 1923	123·0	127·4	137·5	137·6	404,726	388·9	320·5	120·8	391·5	117·3
2 February 1923	122·9	129·6	130·5	138·2	633,484	416·7	321·4	118·7	391·5	114·5
9 " 1923	125·1	136·3	129·7	139·3	676,219	399·0	322·7	118·7	389·7	112·2
16 " 1923	127·1	134·6	128·9	140·5	462,544	404·0	332·6	117·7	395·0	114·8
23 " 1923	126·0	131·6	129·7	138·7	568,125	399·0	323·2	117·7	395·0	108·2
2 March 1923	126·3	132·7	127·3	138·7	447,461	404·0	337·1	119·8	395·0	107·4
9 " 1923	126·0	133·0	128·1	137·0	372,046	404·0	342·0	118·7	398·6	106·2

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

PRODUCTS, MARKETS AND DESCRIPTIONS	2 Mar. 1923	2 Feb. 1923	3 Mar. 1922	Aver. 1913
WHEAT *(cents per 60 lbs.)*				
Canada:				
Winnipeg: No. 1 Manitoba	109	107	143	88
United States:				
Chicago: No. 2 Winter	119¾	117	140	90⅜
Minneapolis: No. 1 North	123	121	155⅛	88¾
New York: No. 2 Winter	132¾	129¼	153	97¼
India:				
Karachi: Karachi white	113	116	n.q.	91
Argentina:				
Buenos Aires: Barletta	122	120	140	100
Germany:				
Berlin: Home grown	106	82	145	129
Belgium:				
Antwerp: Home grown	116	155	148	104
France:				
Paris: Home grown	155	144	178	146
Great Britain:				
London: English	121	119	158	104
Liv. and Lond: No. 1 Man	135	131	180	110
Liv. and Lond.: No. 2 Win	134	132	n.q.	109
Liv. and London: Pacific	143	151	165	111
Liv. and London: Plate	132	131	167	108
Liv. and London: Australian	141	143	163	117
Liv. and London: C. W. Kar	139	140	n.q.	110
Italy:				
Milan: Home grown soft	145	141	171	148
Netherlands:				
Rotterdam: Home grown	114	121	146	108
RYE *(cents per 56 lbs.)*				
United States:				
Minneapolis: No. 2	76⅜	80½	99	63⅝
Germany:				
Berlin: Home grown	94	68	105	99
Belgium:				
Antwerp: Home grown	89	84	125	82
France:				
Paris: Home grown	112	107	113	97
Netherlands:				
Rotterdam: Home grown	97	101	124	90

OCEAN RATES OF FREIGHT AND VOYAGES	2 Mar. 1923	2 Feb. 1923	3 Mar. 1922	Aver. 1913
OCEAN RATES OF FREIGHT (WHEAT AND MAIZE) *(cents per 100 lbs.)*				
Rumania:				
Danube to U.K.	16	16	22	11
Danube to Genoa	16	16	21	10
Canada:				
Canada to U.K.	15	15	18	14
United States:				
New York to Liverpool	7	8	16	10
North. Range to U.K. Cont	11	10	21	13
North. Range to Genoa	.16	15	22	20
North Pacific Ports to U.K.	37	36	44	43
Argentina:				
Plate Down River-U.K.	20	21	30	18
Plate Up River-U.K.	20	22	32	20
India:				
Karachi to U.K.	25	24	24	20
Rangoon to U.K.	29	29	26	29
Australia:				
Australia to U.K.	42	42	52	34
COTTON FREIGHTS *(cents per 100 lbs.)*				
United States:				
New York to Liverpool	20	20	40	30
New Orl. to Liverpool	n.q.	n.q.	45	43

LIVE STOCK STATISTICS

Classification	Number		Increase(+) or decrease(−)	
	Dec. 1, 1922	Dec. 1, 1921	in number	per cent
Horses	3,647,977	3,665,982	−18,005	−0·5
Mules	26,193	27,315	−1,122	−4·1
Asses	5,226	5,633	−407	−7·2
Cattle	16,309,474	16,790,699	−481,225	−2·9
Sheep	5,566,086	5,891,029	−324,943	−5·5
Goats	4,135,950	4,295,548	−159,598	−3·7
Swine	14,682,622	15,817,819	−1,135,197	−7·2
Poultry	65,084,687	67,760,430	−2,675,743	−3·9
Rabbits	3,154,964	4,428,759	−1,273,795	−28·8
Bee-hives	1,829,095	1,930,382	−101,290	−5·2

SCOTLAND

Classification	Number		Increase(+) or decrease(−)	
	June 3, 1922	June 3, 1921	in number	per cent
Horses	211,402	216,621	−5,219	−2·4
Cattle	1,145,400	1,143,135	+2,265	+0·2
Sheep	6,671,453	6,658,511	+12,943	+0·2
Swine	150,386	145,498	+4,888	+3·4

IRELAND

Classification	Number		Increase(+) or decrease(−)	
	June 1, 1922	June 1, 1921	in number	per cent
Cattle	5,156,625	5,197,226	−40,601	−0·8
Sheep	3,566,521	3,708,264	−141,743	−3·8
Swine	1,036,726	977,152	+59,574	+6·1
Goats	250,443	261,204	−10,761	−4·1
Horses	544,464	554,863	−10,399	−1·9
Mules	25,784	27,006	−1,222	−4·5
Asses	232,438	229,648	+2,790	+1·2

ROUMANIA

Classification	Number		Increase(+) or decrease(−)	
	1921	1920	in number	per cent
Horses	1,686,728	1,485,200	+201,528	+13·6
Cattle	5,520,914	4,729,766	+791,148	+16·7
Buffaloes	200,256	145,858	+54,398	+37·3
Sheep	11,194,047	8,689,996	+2,504,051	+28·8
Goats	573,900	499,922	+73,978	+14·8
Swine	3,132,004	2,513,610	+618,294	+24·6

BELGIUM

Classification	Number		Increase(+) or decrease(−)	
	1922	1921	in number	per cent
Horses	230,451	222,055	+8,396	+3·8
Cattle	1,516,769	1,514,953	+1,816	+0·1
Swine	1,139,387	975,748	+163,639	+16·8

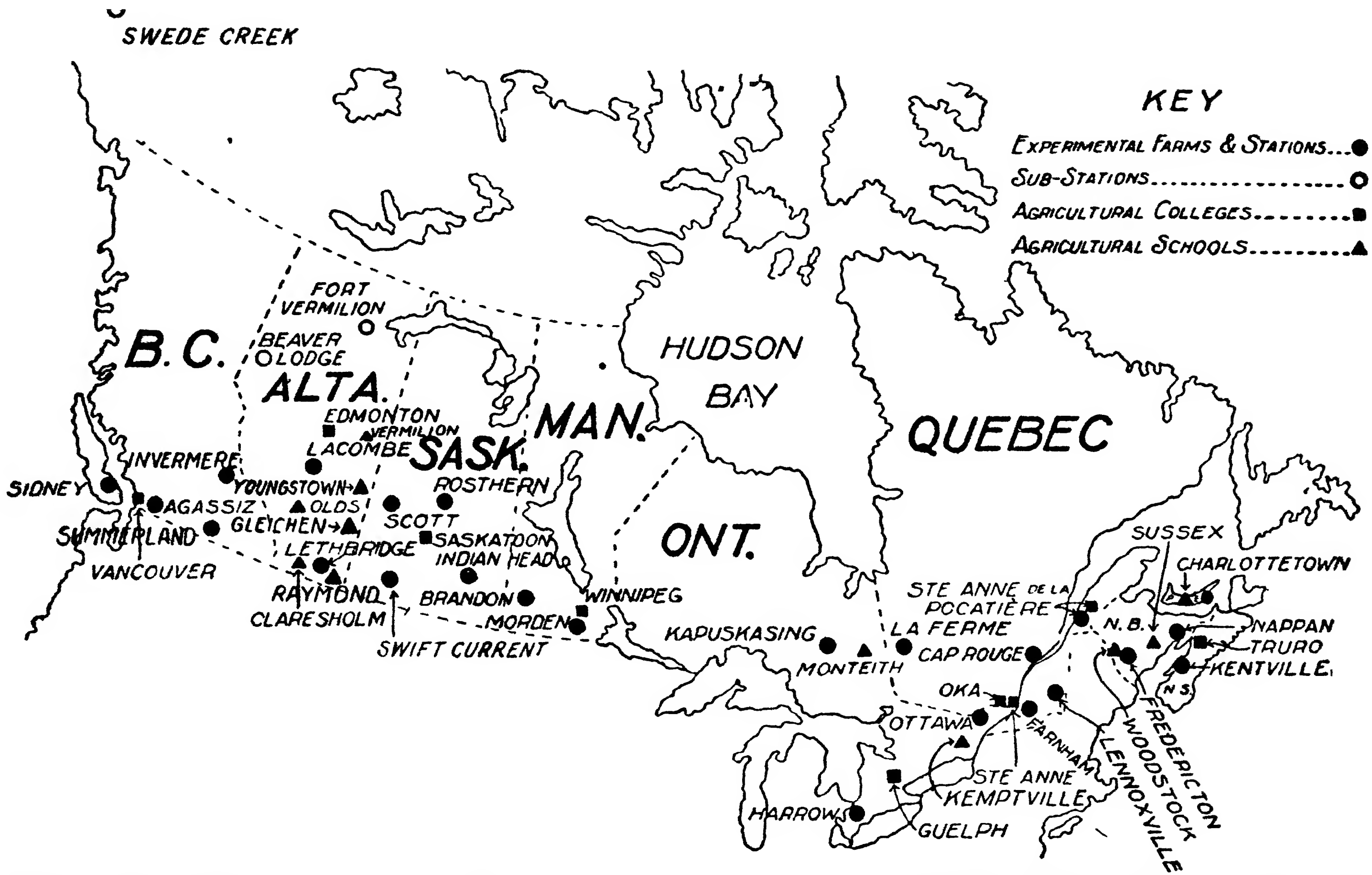
DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 10: No. 4 July-August, 1923

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA



MAP OF CANADA SHOWING THE LOCATION OF FARMS STATIONS AND SUB STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART I

DOMINION DEPARTMENT OF AGRICULTURE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

PART III

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS, PUBLICATIONS AND NOTES

PART V

THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The AGRICULTURAL GAZETTE
OF CANADA

VOL. X JULY-AUGUST, 1923 No. 4

DOMINION EXPERIMENTAL FARMS

THE VANCOUVER ISLAND EXPERIMENTAL STATION

By E. M. STRAIGHT, B.S.A., Superintendent

THE Experimental Station for Vancouver Island and adjacent islands was established at Sidney, B.C., in 1912. It has an area of 125 acres. All the land except the park area is cleared and in a high state of cultivation. The clearing of land on Vancouver Island, necessitating, as it does, the removal of gigantic trees and stumps, the blasting and removal of rocks, and the draining of almost the entire area, constitutes a problem of considerable magnitude, and forces the holder into some system of intensive agriculture, in order to meet the excessive " overhead." The farm, though too small, is not so small on Vancouver Island as it would be considered elsewhere, for here, as nowhere else in Canada, the average holding is small, and the operations carried on are of an intensive character.

The Station is delightfully situated on the Strait of Georgia, about 17 miles from the city of Victoria, and near the northern end of the Saanich peninsula—the garden of Vancouver Island. The farm is traversed by a branch of the Canadian National Railway, and by the B. C. Electric, with a station on the property. These, with several bus lines, make transportation to and from Victoria easy, but from the northern parts of the island the whole peninsula is difficult of access.

The soil, though typical of the district, is a study in itself, and makes great care necessary in conducting experimental work. A small field may contain many types of soil, varying physically and chemically, and changing from the one to the other without apparent reason—from a black prairie soil to muck, to hardpan, to brick clay, or to sand. This variation makes it difficult to obtain uniform areas sufficiently large to conduct exact experimental work, yet it broadens the scope of the investigation, for the reason that the project may be repeated on various types of soil.

While the cereal, forage crop, livestock and all other divisions are represented on the farm, yet there has been a concentration of effort on three lines of endeavour, namely, Horticulture, Apiculture and Poultry Husbandry.

In the Cereal division one has to learn farming anew in this, the " California of Canada." Many of the spring wheats, when sown here in the fall, yield far better than when spring sown. The same is true of the barleys and possibly of other grains. Investigations along these lines are being conducted. In the Forage Crop division, all the usual roots and grasses have been under test, together with a great variety of semitropical plants, made possible only by the mildness of the climate. The Livestock department is receiving more attention than formerly. A small herd of Jerseys has been purchased, and the breed is living up to its reputation. Though the animals comprising the herd have not yet completed their Record of Performance tests, they promise to be outstanding individuals.

Horticulture

The fruits and vegetables of Vancouver Island are well known over much of Canada. Small fruits, especially, are shipped, and favourably spoken of, over the Prairie Provinces. The industry grows with the years. Through co-operative effort in marketing, and otherwise, the growers look for great expansion, especially in strawberry and Loganberry culture. The Experimental Station has kept pace with the growers in the determination of the value of varieties and systems of growing these and other fruits, and all the various cultural methods in use in the different provinces of Canada, are under test. Among the tree fruits may be found practically all of the pears, cherries, plums, and many of the apples grown on Vancouver Island. The collection is quite complete, and includes varieties from many parts of the world. Thus, a constant object lesson is set up, while the merits or demerits of each variety are carefully recorded. All of the newer insecticides and fungicides are under trial, and reports are made regarding them. In this department the fertilizer needs of soils are determined from the standpoint of fruit culture, while the relative value of sod versus clean cultivation, and clean cultivation versus cover crop, are standard projects.

Bulb Culture

Vancouver Island is practically the only part of Canada where bulbs can be commercially grown. That these are superior to the foreign grown bulbs has been determined at this Station. That this fact may be more generally known, the Station has furnished bulbs to all the other Dominion Experimental Farms and Stations in Canada, in order that they may be reported upon. Because of disease, often found in the imported bulbs, great extension in this line is anticipated.

Islands of the Gulf of Georgia from Dominion Experimental Station Vancouver Island B C The Olympian range is perceptible in the distance.

Nut Culture

Walnuts, filberts and other types of nuts can be grown on the Island. In order to encourage this interesting branch of horticulture, a considerable area has been given to that phase of the work. Many inquiries are received from different parts of the Island concerning the industry, and it is possible that, in the future, Canada's needs in this respect may be met from Vancouver Island.

Apiculture

The possibilities of apiculture are receiving attention at the Station. Definite problems are being carefully studied. Already it has been demonstrated that bees are the most potent factor in the pollination of fruit trees. Just how much work they are able to perform, and how important other insects may be in this connection are matters that are under investigation. The Island is being mapped from the beekeeping standpoint as rapidly as time will permit, and the various systems of wintering, prevention of swarming, etc., are under test.

Poultry Investigations

Poultry work at the Station, in keeping with the importance of the industry on Vancouver Island, has received much attention. The work is not only comprehensive but exact. White Wyandottes are kept exclusively. The work is well known, and the demands for information, for eggs for incubation, for day-old chicks, and for breeders are constant and almost Dominion wide. In order to indicate the type of work being carried on, a brief outline of some of the lines of investigation is presented.

Nearly all eggs are incubated during the three months, March, April and May. Questions as to when they should be incubated from the standpoint of future layers, breeders or market birds, are distinct problems in themselves, and must be considered as such. The present project considers incubation wholly from the standpoint of incubation, and tabulates results obtained month by month, other factors being equal. It has been found that, so far as the Island is concerned, early hatched chicks not only hatch better, but the viability of the birds in early season is superior to that of the May-hatched chicks. The converse of this is undoubtedly true in many parts of Canada, especially in those sections where layers and males are closely confined all winter.

Chickens are brooded by various methods year by year. Various types of brooders, including electric brooders, have been used, as well as the natural method. All the methods have advantages and disadvantages. Recently, the coal stove brooder has come to be especially well thought of. With this type of brooder the whole colony house is turned into a brooder; heat is plentiful, while the chickens are able to find, in the various parts of the house, just that degree of warmth they require. In a brooder of this type, the air circulates freely and is consequently pure; the chicks are not forced to pile up in the centre to keep warm, and the capacity of the brooder is much greater than with many other types.

Definite figures have been kept as to the cost of rearing young chicks, of which the following is a summary:—

Cost of Rearing 242 Chicks (8 weeks)

66 eggs at 2½c each	$1 65
39 lbs oatmeal at 3¼c per lb	1 26¾
150 " chick food at 3¼c per lb	4 87½
484 " dry mash at 2¼c per lb	10 62
84 " wheat at 2c per lb	1 68
18½ " charcoal at 5c and 1c	84
51 " fine bone at 2½c per lb	1 27½
28 " grit at 1¼c per lb	35
8 " shell at 1¼c per lb	10
24½ gals skim milk at 2c. gal.	49
Total cost	$23 15¼

Number of chicks well developed at end of 8th week, 242.

Total cost of feed consumed, $23 15¼

Feed cost per bird to end of 8th week, 9.5 cents

The feed consumed by those that did not live to be eight weeks old is charged in the above statement.

The cost of feeding laying stock (Wyandottes) for the year 1922 has been determined, using pens of birds hatched in March, April and May. An average cost has been obtained from the amounts of feed used month by month, based on prices current on Vancouver Island at that time. It was found that the average number of pounds of grain consumed per

bird was 87·9, and that the total cost of same was $2.45.

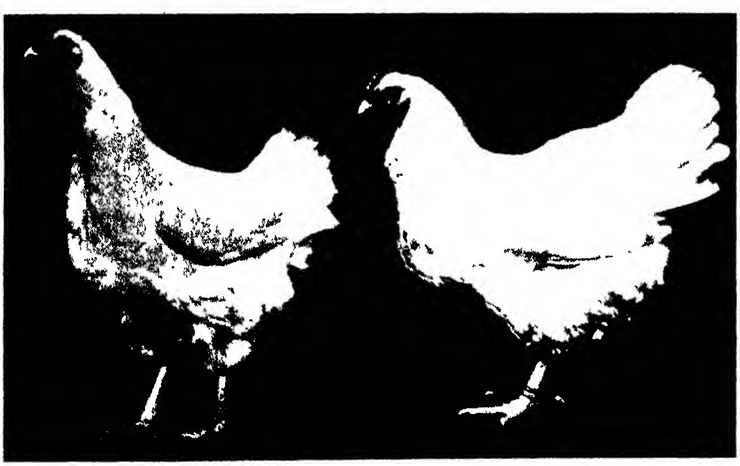
The cost of producing one dozen eggs is known only to a few, and is not easy to obtain. For a number of years this phase of the work has been given much attention. A summary follows:—

——	1919	1920	1921	1922
Average production	179·1	200·8	219	188·2
Pounds of grain and mash to 1 doz. eggs	6·29	5 81	4·61	6·1
Cost of all feed per 1 doz. eggs	23 45c	25·50c.	16·0 c	16·7c.
Month of highest cost	Nov.	Dec.	Nov.	Oct.
Month of lowest cost	June	Feb.	Apr.	May
Month of highest production	Mar.	Mar.	Mar.	Mar.
Month of lowest production	Nov.	Nov.	Oct.	Nov.

Two types of laying sheds are in use at the Station, namely the Woods and the shed-roof open front. The latter is much preferred on account of its simplicity and economy of construction. It is airy and provides for a maximum of sunlight. During the past six years the birds housed in the shed-roof houses have been immune from colds and roup.

The breeding of layers has been continued. Much emphasis has been placed on the various side issues which converge to form the real breeding problem. The breeder is not satisfied with high production if the eggs are small, if the layers are much below weight, if the hens are off type, or if chicks arising from the high-producing type lack vitality or viability; yet, one or more of these factors is often lost sight of, with the result that a weakness persists, is multiplied, and eventually destroys the model. A mental picture of the ideal Wyandotte is constantly kept in the mind's eye, and though it is not possible at all times to measure up to the standard set, much may be done. Close attention to detail in the breeding work has borne fruit. Almost every year one or more birds of outstanding performance have been produced. Among these are "Lady Victoria" and "Saanich Belle."

A study has been made of the relation existing between weight and production in Wyandottes. Contrary to



Lady Victoria (right) and *Saanich Belle* (left)—two noted Wyandotte hens bred at the Dominion Experimental Station, Vancouver Island, B.C.

the idea often advanced, we have found that the heavier the bird the greater the production. For example: 4½-pound birds have averaged 190·3 eggs in the year; from 4½ to 5-pound, 196·5; from 5 to 5½-pound, 208·8; 5½ to 6-pound, 197; over 6-pound, 210·7. The relation between weight and production is nearly constant. The heavier the bird the better she lays. This is a law so far as averages go, but does not follow when applied to individuals.

Free range for poultry has been recommended, and yet many breeders have secured excellent results in very small houses, with practically no range at all. To determine which system will give the best results is the object of the experiment begun in 1922. It has been found, so far as the work has progressed, that the birds laid better when confined than when on range, but that the cost of feed in confinement was greater than on range. In order to secure further information concerning the incubation of eggs arising from the two pens (confinement versus range), hatching and rearing results have been tabulated. It was found that the number of chicks alive on July 1, hatched from the range pen, was more than double that from the confined pen.

The various commercial feeds used for poultry are being fed in comparison with the home-mixed ration, such as is fed at the Station. The conclusion, as determined by results of one year only, is that while hens laid more eggs on the home ration, the feed cost more than the commercial. The explanation may be found in the fact that concentrated protein substances are offered in many forms, some of which may be much cheaper than beef scrap.

The above projects, undertaken in the poultry department, may be accepted as fair examples of the kind of work attempted in all divisions of labour on the farm—practical but exact—in the hope that in some measure we may solve the problems met by the farmer in his daily task.

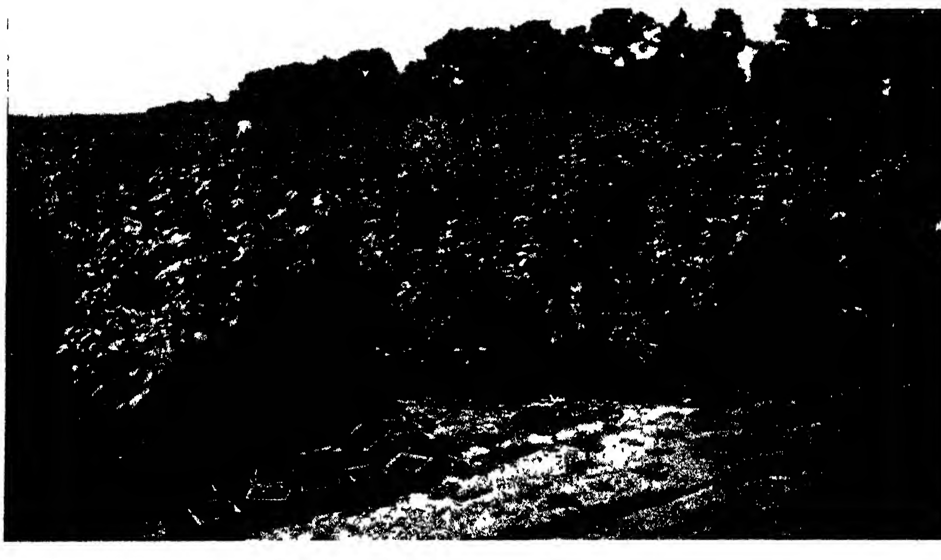
PRAIRIE HORTICULTURE

By W. R. LESLIE, B.S.A., Superintendent, Dominion Experimental Station, Morden, Manitoba

PRAIRIE horticulture is older than the earliest settlements of white people on the plains of Western Canada. The Sioux Indians grew corn and squash before the arrival of English-speaking people, and some westerners claim that the large thickets of wild plums, found on Reservations along the Rainy river and elsewhere, have developed from seed carried thither from Minnesota and Wisconsin by the aborigines. These natives eagerly sought garden seeds from early traders, and several decades ago creditable gardens were to be found on the Moose Woods and other reserves.

The horticultural efforts of the early settlers were necessarily limited. Some had no gardens whatever, and depended on neighbours for potatoes and on the storekeeper for canned vegetables, dried prunes, apricots, and apples. Others grew rhubarb, and a few secured roots of the wild black currant and domesticated them in the garden. The majority, however, followed the custom of the natives and depended on the ravines, coulees and stream flats for a supply of fresh fruits. Indians did a good trade in gathering and selling wild raspberries, strawberries, plums, cherries, red and black currants, gooseberries, Pembinas, Saskatoons, and along the northern and eastern boundaries of the prairies, blueberries and cranberries.

A generation ago there were a number of settlers attempting to grow tree fruits. These were brave voyageurs in an uncharted field and successes were rare. Immigrants from Eastern Canada, the British Isles, and the United States were wont to attempt the growing of the varieties of apples, plums and cherries that they had cultivated in their former homes. Thirty years ago a few apple trees bore fruit. The Indian agent on Rainy lake, close to Fort Frances, Ont., near the eastern edge of the prairies, had a Duchess of Oldenburg tree which bore a number of bountiful crops of good fruit. Mr. A. P. Stevenson, founder of Pine Grove Nursery at Morden, Man., was growing crab apples and beginning to harvest standard apples. These men were trail-blazers, and many triumphs in the culture of tree fruits have since been achieved by dwellers on the Canadian plains.



A raspberry plantation in Manitoba. Raspberries, currants and hardy plums may be relied upon to produce bountiful crops in the Prairie Provinces.

Pre-eminent among the successful fruit growers of the Canadian prairies stand A. P. Stevenson and Sons, of Morden, Man. They have introduced a wide range of horticultural trees, shrubs and plants which proved suited to different prairie zones. As an example may be cited their apple crop of 1921, which totalled 300 barrels. This crop was made up chiefly of fifteen varieties of standard apples. Dr. R. Moore of Fort Frances, Ont., has been growing orchard crops for over twenty years, and has many varieties of apples and plums thriving. Thomas Frankland did much valuable work with plums at Stonewall, Man. D. W. Buchanan in his nursery at St. Charles, Man., developed a number of varieties of improved native plums.

Mr. Norman M. Ross, Chief of the Tree Planting Division, has grown, on the Forestry Station at Indian Head, Saskatchewan, fair crops of such apples as Blushed Calville, Hibernal, Wealthy, and Charlamoff, and bountiful crops of such high quality plums as Tokato and Mammoth. The driveway on the Forestry Station would be considered a place of great beauty even in the most favoured fruit-growing sections

of Ontario. The Forestry Nursery Station at Indian Head, Pine Grove Nursery at Morden, and Assiniboine Park at Winnipeg are beautiful prairie oases, and provide inspiration and substantial encouragement to all home-makers privileged to visit these recently developed beauty spots. In 1905 the Forestry Nursery Station was a prairie cow pasture.

In northern Manitoba, at Valley River, W. J. Boughen is growing many kinds of small fruits, plums and crabapples. He is proprietor of the Boughen Nursery and has done a great deal for Northern Manitoba by showing that fruit-growing can be made a profitable enterprise in the Dauphin district.

The Agricultural Colleges of Manitoba, Saskatchewan and Alberta each has a Department of Horticulture. The various phases of horticultural work are taught to student classes, and demonstration and experimental work is conducted on the college farms.

There is at present a distinct tendency for prairie people to become active in horticulture. A score of prominent agricultural men might be mentioned. Among these is Dr. Seager Wheeler, Saskatchewan's "Wheat King," who is doing breeding work with garden crops and fruits, and intends growing tree-fruit seedlings on an extensive scale.

There is one horticultural association on the prairies of considerable age--the Manitoba Horticultural and Forestry Association. This is a flourishing organization and has done a great amount of good. The Winnipeg Garden Show, considered one of the most impressive annual horticultural exhibitions on this continent, is held under its auspices. Besides sponsoring exhibitions, the Association distributes plant premiums and literature, and the leading prairie

The Hungarian grape, hardy in Manitoba, bears fruit of medium size and fair quality.

horticulturists assemble at its annual winter meeting.

Experimental Farms

The Dominion Experimental Farms and Stations in Western Canada have found horticulture to be one of the lines of work most appreciated by the public, and there is ample evidence to prove that the people of the prairies are giving more attention to beautifying their home surroundings, to the planting of fruits and to the growing of vegetables. There are several reasons for this development. Among them may be mentioned the success that has attended the efforts of the men mentioned above. Prairie people, realizing that they are living in the "Last Great West," are more and more preparing to consider it their permanent home. They are frequently hastened to this conclusion by the return of neighbours who had departed for other provinces and countries, only to find they were better satisfied on the Canadian prairies. Moreover, the continually increasing number of varieties suited to western conditions is another favourable factor in developing prairie horticulture.

The Central Experimental Farm at Ottawa has supplied a great deal of horticultural material to Branch Farms and to private individuals. This assistance has included the distribution of seeds, plants and literature. Much of the plant-breeding work of the Central Experimental Farm has for its primary object the developing of hardy strains for the prairies. Among the notable examples are the Saunders' hybrid apples, early varieties of sweet corn, and early maturing tomatoes.

The branch Farms and Stations of the prairies have not, however, done very much plant breeding with horticultural crops, but the Brandon Farm has produced several new varieties of crab apples and small apples. One of the crab apples has been named "Bedford," and appears to be as hardy as "Osman" and "Columbia," two Saunders' hybrids of outstanding hardiness. The service rendered by prairie Branch Farms to horticulture has been chiefly connected with exhibits at summer fairs, demonstration plantings, reports of experimental projects with vegetables, fruits, shelter belts and hedges, and ornamental trees, shrubs and flowers; in distributing small quantities of seeds and plants, and in replying to enquiries. Of these enquiries there has been a marked increase during the last two years.

The Morden Station

The Experimental Station for Southern Manitoba, at Morden, does major work in horticulture. Many projects in general agriculture are carried on, but special attention is paid to horticulture. Over one hundred acres are devoted to horticultural work. The orchard area is eighty acres, of which about forty-five acres are planted to tree fruits and small fruits. The balance of the orchard is to be planted with selected seedlings and material secured by controlled plant breeding.

Most of the seedling apples and plums that have fruited were developed from fruit grown at the Central Experimental Farm, or by A. P. Stevenson & Sons, Morden. A number of these promise to be of value Two Crusoe seedlings produce large fruit of better quality than any of the many named varieties growing at the Station. Of the 228 seedlings fruiting for the first time in 1922, there are fifteen being propagated for retesting. Ten acres of young apple seedlings were set out in 1916 and of these 327 have already borne fruit. The fact that two seedlings are of outstanding promise, and that more than a dozen others warrant further testing, encourages confidence in the belief that marked advances may be expected when controlled plant

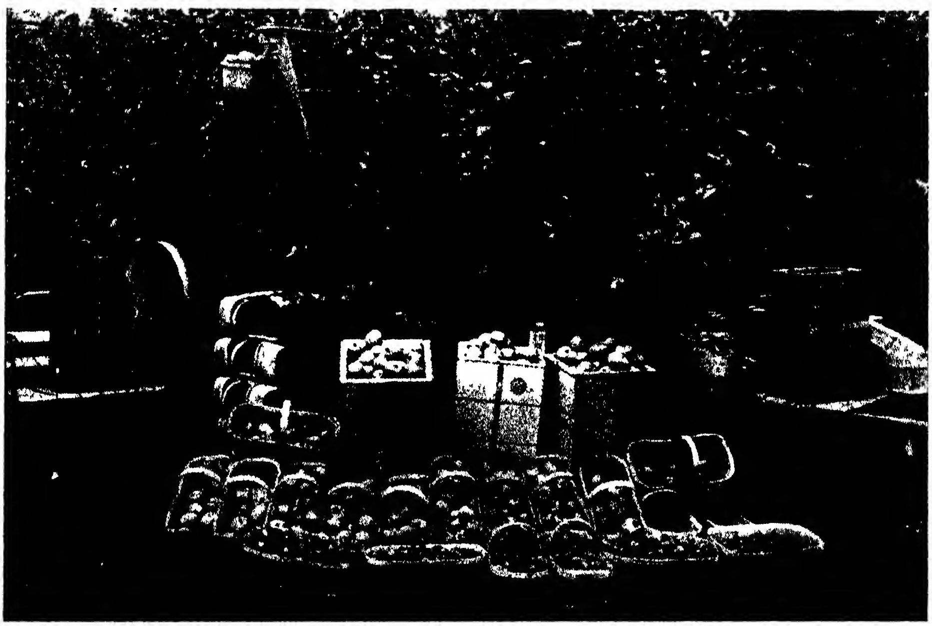
breeding is done for the prairies, on the prairies, by using strains that have proved themselves adapted to prairie conditions. The Morden Station has been equipped with a greenhouse to facilitate breeding work with fruits and vegetables.

In order to accumulate a great variety of strains of horticultural plants as a basis for prairie plant breeding, the Dominion Horticulturist has had supplied to the Morden Station what is probably the largest collection of hardy fruits on the American continent. The collection includes fruits from Russia, Siberia, Manchuria, Peace River, Northern Manitoba, Lake Superior, Northern Minnesota, and many other places.

Trial orchards are being developed for the Central Experimental Farm, for the Fruit Breeding Farm of the University of Minnesota, and for the South Dakota Station. One orchard is completely planted to selected native fruits and nuts. Wild plums are receiving much attention, and 8,000 trees grown from selected fruit were permanently set out in 1922.

Considerable work of value has been accomplished in vegetable culture. The most impressive is probably the success in growing melons of high quality.

A systematized arboretum to embrace all procurable hardy trees and shrubs is to be established. This is a line of work deserving more attention than it has yet received on the prairies.



Apples grown at the Morden Experimental Station, Southern Manitoba. The trees are headed close to the ground.

Conclusions

Experience has shown, (1) that one of the essentials for success with prairie horticulture is a well planted and thriving windbreak or shelter belt; (2) that only hardy varieties of fruits should be selected; (3) that a number of the native prairie fruits have distinct value (some serving as stock for budding and top-working); (4)

the effectiveness of plant breeding as a source of improved varieties; (5) that there is a wide range of herbaceous perennials suitable for planting. (Immigrants from the British Isles have contributed much by introducing varieties of flowers); (6) that beautiful surroundings, productive fruit plantations, and excellent vegetable gardens are possible on the prairies.

Just as the prairie states to the south had to depend on their own efforts in securing hardy fruits, so will prairie Canada. Considerable work is being done on the problem, encouraging successes are being secured, and the number of people interested in horticulture is expanding rapidly.

New varieties will come largely from seedlings raised on our own prairies. Therefore, let all those who are able join in the development by sowing seed and pits of hardy apples, plums, cherries, and pears.

FURTHER CLASSIFICATION OF ELEVATOR SCREENINGS

By GEORGE H. CLARK, Seed Commissioner

Acting on the recommendation of the Advisory Board under the Feeding Stuffs Act, an arrangement in the interests of live stock feeders has been made whereby grain inspectors' certificates covering shipments of screenings from the terminal elevators at the head of the lakes will serve more adequately to classify this material according to its general character and utility value.

At the instance of the Board of Grain Commissioners a conference was recently held at Fort William, at which representatives of all sections of the grain trade, members of the Grain Inspection Department, and officials responsible for the enforcement of the Feeding Stuffs Act were present to discuss the general practices employed in the handling and disposal of grain screenings.

Concurrently with this discussion the Grain Commissioners, acting as a board of hearing, received evidence in support of a complaint by a Fort William feed manufacturing firm regarding the quality of screenings supplied them by a local elevator. From this evidence it developed that for the protection of holders of warehouse receipts for grain, inspection of all materials removed from the terminal elevators was required, but the designation "elevators screenings" on grain inspectors' certificates had been regarded only as a permit to remove from the elevator waste material cleaned from the grain, and was not intended to designate any specific grade or quality of material.

The Canada Grain Act does not provide for the grading of screenings; but at the request of the Advisory Board under the Feeding Stuffs Act a classification was made some two years ago for "Standard Recleaned Screenings," since which time, on request by the shipper, a certificate bearing this designation has been issued by the grain inspectors covering shipments found to contain not more than three per cent of fine weed seeds, and it has been reliably ascertained that screenings so graded rarely contained in excess of one per cent of the objectionable mustards.

More than sixty thousand tons of Standard Recleaned Screenings have been sold for feed purposes during the past year, and thus far no injurious effects to the health of live stock, resulting from their use, have been reported. Standard Recleaned Screen-

ings from the 1922 wheat crop have been found to contain on the average about 48 per cent of broken and shrunken wheat and 41 per cent of wild buckwheat. The composition will naturally vary with the season and source of origin. Recleaned screenings from wheat grown in north-eastern Saskatchewan and Manitoba will normally contain a higher percentage of wild buckwheat and a lower percentage of broken and shrunken wheat than will screenings from wheat grown in the drier areas where wild buckwheat does not thrive so well. Wild buckwheat approximates cultivated buckwheat in feeding value; but its black seed coat imparts a dark appearance to ground screenings, for which reason feeders at first are apt to object to it.

Standard Recleaned Screenings should never be fed to young pigs or calves, but have proved to be a satisfactory and comparatively inexpensive feed for mature stock, particularly pigs, which, however, will promptly refuse to eat it if the mustard seed content is more than about one per cent. This material ought always to be very finely ground, but none of the ordinary steel plate choppers are capable of crushing all of the fine weed seeds which almost invariably are present in small proportions.

In addition to Standard Recleaned Screenings there is separated at the terminal elevators a further screenings product which possesses reasonable uniformity in composition and a feeding value comparable with that of No. 2 feed oats. This product is composed chiefly of wild oats, with a small percentage of cultivated oats, wheat, and other coarse grains, is practically free from fine weed seeds, and is shipped out under the grain inspector's certificate as "Oats Scalpings."

Of the several classes of elevator screenings, Standard Recleaned Screenings and Oats Scalpings only have been given a commercial status ensuring uniformity to the purchaser. When placing orders, therefore, purchasers should always specify Standard Recleaned Screenings or Oats Scalpings, as the case may be; otherwise they are apt to be supplied with material which in general appearance resembles Standard Recleaned Screenings but which actually contains an excess of the fine, black weed seeds, and for which the grain inspector's certificate bears the designation "Elevator Screenings."

THE DAIRY AND COLD STORAGE BRANCH

Origin and Development.—Delegates from the Dairymen's Associations in the several provinces assembled in Ottawa on April 9, 1889, and petitioned the Government to appoint a Dairy Commissioner for the Dominion. The suggestion was favourably received, and the result was that Professor Jas. W. Robertson was appointed to the position on February 1, 1890, and Mr. J. C. Chapais was made Assistant Dairy Commissioner, with headquarters in the province of Quebec. Professor Robertson was at the same time appointed Agriculturist to the Experimental Farms, and continued to hold the dual position until December, 1895, when he was relieved of his duties as Agriculturist and devoted his whole time to the Dairy Branch as Agricultural and Dairy Commissioner.

The work of the branch was developed and expanded until, in 1901, divisions had been created for dairying, live stock, cold storage, extension of markets, fruit, seed, and poultry. When Professor Robertson resigned

on January 1, 1905, a reorganization took place by which the Live Stock and Poultry divisions became the Live Stock Branch, and the Seed division was also raised to the status of a branch, leaving as the Dairy Branch the divisions of Dairying, Fruit, Extension of Markets, and Cold Storage under a Dairy Commissioner (Mr. J. A. Ruddick), whose title was changed a year later to that of Dairy and Cold Storage Commissioner.

On April 1, 1914, the Fruit division was made a separate branch, leaving the Dairy Branch with its present Administrative, Dairying, Extension of Markets, and Cold Storage divisions.

Administrative Division.—This division has, of course, the general direction of all the activities of the branch and the organization of new lines of work. The general progress of the dairying industry, new processes and developments throughout the world, as well as general market conditions for dairy produce, are studied, with a view to their effect on Canadian conditions. The division also keeps in touch with the provincial Departments of Agriculture to preserve the proper correlation and co-operation of the work of the federal and provincial departments in matters connected with dairying.

Dairy Division.—During the early years of the existence of the branch the Dairy division took an active part in establishing the manufacture of cheese in Prince Edward Island, operating a number of factories for several years. Another piece of pioneer work was the establishment of creameries in the Northwest Territories. The creameries were erected by local co-operative societies and operated by the branch until the creation of the provinces of Saskatchewan and Alberta, when the work was turned over to the provincial departments of agriculture. Another line of work was the inauguration of winter creameries, which were operated as dairy stations at several points in Ontario and other provinces. Until this demonstration was undertaken there was no creamery butter manufactured in Canada during the winter months.

In 1902 a campaign was started with the object of improving the quality of Canadian cheese through the control of the temperature in the curing rooms. The Commissioner was authorized to erect and operate for a period of five years, four model curing rooms at different points in Ontario and Quebec for the purpose of demonstrating the value of this improvement.

The data secured through the operation of these curing rooms showed that the quality of the cheese was greatly improved, and that there was a sufficient saving in the shrinkage of the cheese by being cured at a lower temperature to meet the cost of making the improvements in the curing rooms. Briefly, the demonstration was so conclusive that no cheese factory is now considered to be fully equipped without some means of controlling the temperature in the curing room, and " cool cured " cheese is quoted at a premium on the market.

During the years 1908-9 a thorough investigation was made of the methods followed on the farms in caring for milk intended for the manufacture of cheese. It was found that the practice then in vogue was not only useless, but in many circumstances positively harmful. As a result of the investigation the division was able to recommend an effective treatment which required less labour and apparatus. The presentation of the case was so conclusive that the care of milk for cheesemaking was revolutionized in a single season and the quality of the cheese greatly improved.

At the present time the only dairy station in operation is located at

Finch, Ontario, where a combined butter and cheese factory was built in 1912. The objects aimed at in establishing this station were to provide facilities that would enable the Dairy Branch to—

(*a*) Control and operate a model combined cheese factory, creamery, and milk and cream shipping station;
(*b*) Demonstrate the advantages of a well-conducted factory, equipped to take advantage of the highest market for cheese, butter, milk, or cream;
(*c*) Encourage the production of winter milk;
(*d*) Conduct experiments and investigations relating to the manufacture of butter and cheese;
(*e*) Demonstrate new processes and to try out new appliances;
(*f*) Demonstrate the value of the cool curing of cheese; and
(*g*) Study the economics of dairy factory operation.

Being responsible for the successful operation of this factory conducted on strictly commercial lines, the Dairy Branch is brought into close contact with the problems that confront other manufacturers of cheese and butter throughout the country.

The supply of milk at the Finch Station is nearly four times as great as in 1912, the first year it was operated. The average return to patrons is from ten to fifteen cents per hundred pounds of milk higher than the average received at factories where only cheese is made. A considerable portion of the milk supply is sold to milk distributors in Montreal either as milk or cream. With the necessary equipment to make butter or cheese, or sell milk and cream, on short notice, the management is able to dispose of the products in the highest market prevailing at the time. It is believed that this type of dairy factory is a solution of some of the difficulties which producers have found themselves in during the last year or two in some parts of Ontario.

An important activity of the Dairy division is the promotion of cow-testing whereby, in co-operation with the owner, records are kept of the individual cows in the herd. Records of 50,304 cows were kept in 1922. This work is entirely distinct from the Record of Performance Test carried on by the Live Stock Branch, which is official. The cow-testing promoted by the Dairy division is unofficial, as the owner of the herd weighs the milk and takes the samples for testing. The object is, of course, to show the farmer which are his best and which are his poorest producers so that he can eliminate the poor cows and breed only from those that give the best returns.

A Dominion Educational Butter-scoring Contest was inaugurated in 1919, and has been continued since. The object is to develop uniform methods of manufacture throughout the various buttermaking sections, to standardize the quality, and to establish uniform grades throughout the whole Dominion. This contest has demonstrated that butter of a uniform type and quality can be made in every part of the Dominion.

A new line of work was undertaken in 1920 in the grading of dairy produce for export. The grading has been limited so far to the grading of cheese for sale by auction at Montreal by an Ontario co-operative society, but in accordance with the desire of the producers, the system was, on April, 1923, extended to all dairy produce exported.

A very important service in connection with the grading of dairy produce is carried on by the division with a view of procuring uniformity in the work of grading as carried on by provincial authorities in the different provinces. Conferences of the graders are held from time to time

and classes in the grading of dairy produce are conducted by the Chief of the division at the various dairy conventions and exhibitions held throughout the year.

The holding of conferences with the provincial dairy authorities not only in connection with the grading of dairy produce, but with reference to various other phases of government dairy work, has produced most excellent results, tending to co-ordinate and unify the work throughout the Dominion, to promote standard methods and practice, and to serve as a means of education for all those who participate in these conferences.

An Investigator of Dairy Weights and Measures is located at Montreal who examines complaints of cheese and butter manufacturers as to the weighing of their products at that point.

Extension of Markets Division.—Cargo inspectors were appointed in 1900 to examine all cargoes of perishable produce as loaded on steamers at Montreal and other Canadian ports for export to the United Kingdom. Other cargo inspectors were located at London, Liverpool, Bristol, Manchester, and Glasgow, to examine the cargoes as discharged from the steamers. This service has been continued and improved from time to time. The names of consignors and consignees, the condition of packages and contents at the time of loading and discharge, and the stowage of the cargo, etc., are noted by the inspectors. Recording thermometers are placed in refrigerated chambers, and the record forms part of the detailed report which is forwarded to headquarters at Ottawa from both ends of the voyage on all steamers carrying perishable food products. Copies of these reports may be obtained by any person interested in particular shipments. Much improvement has resulted in the packing, handling and stowage of cargoes, and better ventilation of ordinary cargo space has been provided since this service was inaugurated.

A market reporting service for butter and cheese has been provided during the past four years in the form of a Weekly Market Letter which is sent to every person who asks for it. Paid telegrams are sent twice a week to officials in various districts by whom the information is communicated to salesman in the surrounding territory. Collect telegrams are sent direct to any salesman who makes a request for them. These telegrams give the prices paid on the Montreal and Toronto markets up to a few hours before they are despatched.

A monthly News Letter containing items of general interest concerning the dairy industry throughout the world is sent to every cheese factory and creamery in Canada and to any person who asks to have his name placed on the mailing list.

The enforcement of the Dairy Industry Act, and of the Oleomargarine Act as it refers to the sale and use of oleomargarine, has been entrusted to the Markets division. This work includes investigations into the adulteration of butter by excessive water and by foreign fats, weights or prints of butter, proper marking of butter, adulteration of cheese, proper branding of cheese, sale and use of oleomargarine, weights of fats, weights of prints of butter, proper marking of same, as well as prevention of mixing of butter and oleomargarine. In connection with this work the inspectors of this division have power to confiscate dairy produce in connection with which illegalities have occurred, and they can also prosecute the manufacturer or dealer involved.

Cold Storage Division.—In 1895 the work of organizing the cold storage services was begun by the Dairy Branch. The export butter trade of Canada owing to improvement in other countries and keener competi-

tion from abroad, had shrunk to almost nothing. There was no organization to provide for the carriage of butter in refrigerator cars in Canada or in cold storage space for overseas shipment. No one could get a refrigerator car unless he had a car load to ship and few creameries had any provision for cold storage. The Commissioner was authorized to arrange with the railway companies to run refrigerator cars once a week over stated routes for the carriage of butter in small lots. At the present time cars are run weekly on some 65 different routes from country points to Montreal and other market centres. The Government guarantees two-thirds of the earnings of a minimum car load from starting point to destination plus $8 per car for icing. Inspectors are employed at terminal points to note the quantities in each car, to see that the cars are in proper condition and that they have been fully iced.

Since 1897 the creameries have been encouraged to erect cold storage rooms by the payment of a bonus of $100 for a cold storage erected and equipped according to plans and specifications supplied free by the Branch.

The steamship companies were encouraged to provide refrigerated chambers in 1896 when the Government offered to pay half the cost of installing the machinery on a number of ships. In the course of the next five years there were 34 steamers in the St. Lawrence trade equipped with cold storage space. Before the war all the regular steamships were equipped with cold storage facilities. With these improvements the export of butter increased rapidly until the maximum of 34,000,000 pounds was exported in 1903.

In 1907 an Act was passed authorizing the Minister of Agriculture to enter into contracts for the payment of subsidies to assist in the erection of public cold storage warehouses in places where no cold storage already existed. With this encouragement local cold storage warehouses were established at many points throughout the country thus providing additional market for perishable products of seasonal production to be carried for consumption during the months of scarcity. This policy also had the effect of preventing the concentration of food products in the hands of large companies at central points. Since the inauguration of this law, 34 cold storage warehouses have been assisted, with a total refrigerated space of 4,978,304 cubic feet, on which the total subsidy payable is $722,506.41.

Results.—It is rather difficult to make a definite statement of the results which have followed the various activities of the Dairy and Cold Storage Branch during the last thirty years. Those who are engaged in this kind of work may be accused of over-estimating its value. There is a natural tendency to do so. Perhaps the best way of putting the case would be to state the progress that has been made in lines of work covered by those activities and let the public make their own estimate.

The cheese making industry of Prince Edward Island, which was established under the auspices of this Branch, grew rapidly and has become an important item in the agriculture of that province.

The creamery industry in Alberta, Saskatchewan and Manitoba has continued to develop until the total quantity of creamery butter manufactured in these three provinces during the past year was 34,626,051 pounds.

Winter creameries are now regularly operated in every part of Canada.

No cheese factory is now considered to be complete in equipment without provision for control of temperature

as demonstrated by the cool curing rooms established under the auspices of the Branch in 1902.

The Finch Dairy Station, as a model factory, has been copied in many localities, and will have an important influence on the factory system of Ontario.

Iced cars were not used for the shipment of butter or cheese from country points to the leading markets, as is the case at the present time. The creamery butter industry has been greatly stimulated by this service.

There was no cold storage on steamships sailing out of Montreal until the matter was taken up and promoted by the Dairy and Cold Storage Branch. All steamers in the regular trade with the United Kingdom are now equipped with cold storage facilities.

The cargo inspection services at Canadian and United Kingdom ports, first organized about twenty years ago, have certainly been the means of securing important reforms in the handling of Canadian products in transit between the Canadian shipper and the Old Country merchant. Improved methods of loading on steamships at Montreal have greatly reduced the damage to packages which formerly occurred. More care is exercised in placing perishable products in the best available space on board ship, and such space is now much better ventilated than it formerly was. Twenty years ago there was no cold storage on the docks at any port in the United Kingdom. The butter and cheese was frequently left for many days in the dock sheds before being removed. Armed with the specific information which the cargo inspectors were able to supply, an agitation was begun which was followed by the establishment of cold storage warehouses especially for Canadian produce on the docks at London and Liverpool. The port of Bristol also erected cold storage warehouses at Avonmouth. Butter and cheese can now be discharged direct from ship to coldstore at these ports.

The efforts of the Branch in bringing provincial experts together in grading and other conferences have resulted in remarkable uniformity in the quality and character of butter and cheese made in all parts of Canada.

Since the cow-testing propaganda was started, the annual production of milk in Canada as a whole has been increased by over 1,000 pounds per cow. If we multiply this quantity by the number of cows in Canada we find that the production in one year is three and a half billion pounds more than it would have been if there had been no increase in the individual yield. The value of this increase at the average net value of $1.50 per hundred amounts to over $53,000,000.

The numerous bulletins published, the articles prepared for the agricultural and other press, and the addresses delivered at conventions and public meetings must have stimulated interest in, and added something to, the fund of general knowledge of the subjects treated.

The extensive correspondence carried on, and the personal contact of the experts of the staff with practical dairymen have surely not been without some influence for good.

It would not be correct to take credit for all the improvements that have been cited. Some of them would have come sooner or later without any government assistance or encouragement, but they arrived more quickly and were probably established on a better basis by the help that came from expert direction and suggestion.

COW TESTING REPORT

THE cow testing report for 1922, shows that each year a larger number of dairy farmers are taking advantage of the plan of the Dairy and Cold Storage Branch to obtain records of production of milk and fat from the individual cows in their herds. The following tables give the results of the work in the different provinces as shown by records received by the Branch.

TOTAL NUMBER OF HERDS, COWS, TESTING CENTRES AND TESTS MADE BY PROVINCES, 1922

Province	Number Herds	Number Cows	Testing Centres	Sample Tested
Alberta	111	1 165	36	5 239
British Columbia	22	100	2	553
Manitoba	82	798	23	[illegible] 702
New Brunswick	137	1 061	21	4 879
Nova Scotia	360	2 520	18	13 497
Ontario	783	10 347	[illegible]	41 582
Prince Edward Island	164	1 046	15	5 217
Quebec	3 469	33 26	463	129 991
Totals (1922)	5 128	50 301	[illegible]	203 660
Totals (1921)	5 194	47 895	11	194 747

NUMBER OF HERDS AND COWS RECORDED FOR EIGHT MONTHS OR OVER, AND THE AVERAGE PRODUCTION BY PROVINCES FOR THE YEAR 1922

	Number Herds	Number Cows	Average Production: Milk	Test	Fat
			lb.		lb.
Alberta	34	303	[illegible]	3.66	290.6
British Columbia	10	39	6 614	3.8	251.8
Manitoba	13	111	6 49[illegible]	3.41	221.5
New Brunswick	36	256	5 345	3.86	206.8
Nova Scotia	158	860	5 342	4.32	230.8
Ontario	118	1 229	7 089	3.49	247.6
Prince Edward Island	51	265	6 875	3.75	261.5
Quebec	230	2 211	5 010	3.9	195.5
Totals and Averages (1922)	650	5 274	5 831	3.8	221.9
Totals and Averages (1921)	580	4 448	5 801	3.69	214.1

NOTE.—The figures for British Columbia represent only the testing work in districts where the Provincial Cow Testing Associations are not in operation.

While during 1922, there were 826 more cows recorded for eight months or over than in 1921, the average production of milk and fat shows an increase during the year and the average test was increased from 3.69 per cent to 3.8 per cent.

FINCH DAIRY STATION NOTES

A RECORD of the quantity of milk supplied each year from 1913 to 1922, inclusive, by thirty of the original patrons of the Finch Dairy Station, operated by the Dominion Dairy Branch is presented below. Each of these men has sent his milk regularly to the Station since its inception. The majority have greatly increased their annual output. The record of Patron No. 17 is

particularly noteworthy, showing an increased delivery of 345 per cent during the period The total production of the thirty original patrons for 1922 shows an increase of 34 per cent as compared with their total for 1913

RECORD OF INCREASE IN MILK PRODUCTION OF THIRTY ORIGINAL PATRONS

Patron s Number	1913	1916	1918	1920	1922
	Lbs	Lbs	Lbs	Lbs	Lbs
1	56 238	41 250	67 312	71 062	66 252
2	56 642	49 196	48 662	64 728	77 857
3	39 057	24 035	34 739	31 692	34 297
4	57 382	47 255	51 896	39 564	30 647
5	48 330	27 485	23 537	17 660	28 835
6	71 117	52 456	74 436	88 996	113 336
7	51 507	35 063	31 735	27 160	45 933
8	29 631	34 283	44 157	57 741	74 343
9	62 275	28 316	73 60[illegible]	68 786	84 349
10	105 983	129 003	156 017	140 962	127 856
11	12 743	24 024	30 228	31 809	48 666
12	15 059	15 498	21 933	19 331	31 709
13	53 953	77 552	68 101	67 310	107 263
14	51 594	48 741	50 315	46 144	56 002
15	33 230	33 344	45 088	38 752	36 22[illegible]
16	103 331	67 402	109 639	99 672	102 329
17	35 475	2 876	22 848	99 864	158 161
18	76 734	69 157	73 255	80 282	130 844
19	56 151	52 142	49 438	57 028	77 560
20	85 806	89 684	87 570	79 029	86 82[illegible]
21	57 086	55 439	62 975	56 689	87 885
22	49 027	37 171	38 169	35 846	53 071
23	57 654	68 966	71 813	82 957	88 578
24	57 614	60 668	69 198	80 011	102 063
25	22 654	36 710	41 094	58 314	49 954
26	33 021	49 007	40 673	33 112	50 585
27	14 900	22 031	1 311	52 498	74 768
28	42 693	55 367	49 642	47 253	67 336
29	60 592	50 578	61 436	52 043	42 8[illegible]
30	26 355	28 268	36 430	36 884	51 141
Total	1 523 834	1 412 967	1 637 330	1 743 182	2 187 512

The following table showing the number of months during which milk was supplied each year by the different patrons illustrates the development of winter dairying by patrons of the Station.

1913		1916		1918		1920		1922	
Number of Patrons	Months Sent	Number of Patrons	Months Sent	Number of Patrons	Months Sent	Number of Patrons	Months Sent	Number of Patrons	Months Sent
7	11	6	12	11	12	16	12	22	12
7	10	3	11	3	11	3	11	4	11
6	9	4	10	4	10	3	10	1	10
4	8	5	9	5	9	5	9	3	9
3	7	6	8	4	8	3	8		
3	6	2	7	2	7				
		1	6	1	2				
		1	3						

In the first year of operation, the total quantity of milk received at the Station was 2,069,281 pounds In 1921, it was 6,586,485 pounds, and in 1922, 8,781,879 pounds

PART II

Provincial Departments of Agriculture

NUT CULTURE — A NEW AND INTERESTING BRANCH OF HORTICULTURE

By JAMES A. NEILSON, B.S A., Lecturer in Horticulture, Ontario Agricultural College, Guelph

Status of Nut Culture in the United States and Canada

THE conservation and improvement of our native nut trees and the introduction of suitable varieties from foreign lands have not occupied a prominent place in horticultural activities in North America until just recently, except in the Southern and Western United States, where a great deal of interest has been shown during the last twenty years in this place of horticulture.

In the Southern States the Pecan has been greatly improved and widely planted, and in the Pacific coast region the English or Persian walnut and the almond are extensively grown. As a result of this development large quantities of fine nuts are produced annually and millions of dollars are thereby added to the wealth of the country.

The interest in and the possibilities of nut culture are fortunately not confined to the American South and West. In the northern and eastern States and in Canada there is a growing interest in this useful but much neglected branch of horticulture. An example of this commendable movement is seen in the organization and activities of the Northern Nut Growers Association. This organization was formed in 1909 and is composed of men and women from almost every station in life who are interested in the culture of nut trees and the extension of the use of nuts as articles of human food. At the instigation of members of this Association, the State of Michigan has undertaken an extensive programme of nut tree planting along the state highways, and in other northern states good work has been done to encourage people to plant more and better nut trees.

In Ontario comparatively little has been done to improve and plant our valuable nut trees, and unless something is done to interest the public in this movement, we shall lose a golden opportunity to save for ourselves and posterity the remnant of the fine nut trees which formerly grew so abundantly in some parts of this province.

Realizing that some action should be taken, an attempt was made in the spring of 1921 to draw the attention of the public to the desirability and possibilities of nut culture. This endeavour was conducted along four main lines:

First.—A study of the occurrence and distribution of native and introduced nut trees with special reference to the location of superior species.

Second.—Introduction of new varieties from foreign lands for test purposes.

Third.—Improvement of poor or ordinary trees by top-grafting with scions of superior trees.

Fourth.—Educational work by means of lectures to students, horticultural societies, women's institutes

and other organizations, and also by articles for the press.

Our survey for nut trees was carried on by field trips and by means of a questionnaire, which was sent to officers of Horticultural and Agricultural Societies, Agricultural Representatives, School Inspectors, horticultural and agricultural journals, and the newspapers.

The questionnaire was as follows:—

Q. 1. Are any of the following kinds of trees growing in your locality?

American Black Walnut.
Japanese Walnut.
English Walnut.
Chinese Walnut.
Butternut.
Hickory Nut.
Pecan.
Sweet Chestnut.
Chinese Chestnut.
European Chestnut.
Japanese Chestnut.
Beechnut.
Hazelnut.
Filbert.

Q. 2. Do you know of any individual trees of the above mentioned kinds that are superior because of large size of nuts, good flavour of kernel, thin shells, rapid growth or high yields? Please give exact location of such trees.

Q. 3. Is any one in your section making an effort to grow any native or foreign species of nuts? If so, please give their name and address.

A large number of replies were received which furnished us with some valuable data on the occurrence and distribution of native and introduced nut trees. Moreover, these replies showed that many people were keenly interested in the culture of nut trees and heartily approved of the inquiry.

Description and Distribution of Nut Trees in Ontario

The chief nut trees native to the province of Ontario are the black walnut, the white walnut or butternut, the hickory, of which there are four species, the chestnut, the beech and hazel. Of introduced nut trees there are the Persian, Japanese and Chinese walnuts, European, Japanese and Chinese chestnuts, pecans, filberts, and the Turkish tree hazel.

The Black Walnut, *Juglans nigra*.—The black walnut is one of our finest native trees, and is found growing naturally along the north shore of lake Erie and lake Ontario and around lake St. Clair. It has been planted in many other parts of Ontario, and does well where protected from cold winds The tree grows to a large size, often attaining a height of 90 feet and a trunk diameter of four feet. When grown in the open, it makes a beautiful symmetrical tree having a large rounded crown with drooping lower branches. Contrary to general belief, the native walnut grows quite rapidly and occasionally bears early. About eighteen years ago I planted several nuts around the buildings and along the roadside on my father's farm. Most of the nuts germinated and some trees have made a rapid growth. The largest tree of the lot measured 37·2 feet tall and had a trunk diameter of 14 inches just above the ground in August last. It began to bear in the sixth year and has borne nuts almost every year since then. The nut is of medium size and of good flavour. Some of the trees from the same planting are almost as large and bear larger and better nuts than the one described.

Trees that produce large, easy-cracking nuts with fine-flavoured kernels have been located in the Northern States and are now being propagated extensively as named varieties. The Thomas, Ohio, Ten Eyck

and Stabler are some of the best varieties which are now available for planting. The Stabler produces a nut which usually has a one-lobed kernel, and when the shell is cracked, this lobe comes out entire in about 70 per cent of the specimens. Several promising trees have also been found in Ontario, and we are hoping that, when our search for good trees is completed, the best native sorts will prove to be as good or better than the best named varieties found in the United States.

The Butternut, *Juglans cinera*.—The butternut or white walnut is much hardier than the black walnut and has a wider distribution in Canada. It is found from New Brunswick westward throughout southern Quebec and Ontario to southern Manitoba. Near Portage la Prairie there is a grove of seventy-seven trees which have grown to a fair size and have borne several crops of good nuts.

The butternut will grow on a variety of soils, but like the walnut, succeeds best on a rich well-drained loam. The tree sometimes attains a height of 70 feet and a trunk diameter of three feet. When growing alone, the trunk often divides into several branches, forming a triangular shaped outline. Like most other trees, the butternut varies greatly in productiveness, some trees yielding up to twenty bushels, while on others the yield is light. Some superior varieties are now being propagated and will be available for planting in a short time.

Japanese Walnuts.—The Japanese walnut is represented in Ontario by two pure types, *Juglans Sieboldiana*, the smooth shelled butternut-shaped type, and *Juglans cordiformis* or the Heartnut, and one hybrid which is a cross between the Sieboldiana and the butternut.

The *Sieboldiana* and the *cordiformis* types are characterized by very rapid growth, early and heavy bearing and marked beauty of form and foliage. These trees are considered by some to be our most beautiful nut trees, and are worthy of much wider planting as ornamental trees alone. They are believed to be hardier than the black walnut, having been grown and fruited in regions where the black walnut does not thrive. As a nut-bearing tree, the heartnut is the most valuable. The nuts are distinctly heart shaped, have a thin shell, crack easily and contain a kernel of good quality. In the best varieties the kernel can often be removed entire from the shell by a light tap of the hammer. Some superior trees of this species have been located in the northern States and are now being propagated as named varieties by nurserymen. Of these the Lancaster, Ritchie and Stranger are considered the best so far discovered. Some very good heartnut trees have been found in Ontario, and plans are being made to propagate them for test purposes. There is an excellent tree on the farm of Mr. A. H. Parker, near Islington, Ontario; another equally good one grows on Mr. Bert Scheer's property east of Aldershot; two very nice trees are found on Mrs Norah Bullock's place across the road from Scheer's, and two fine trees on Mr. Sylvester Kratz's farm at Jordan Station. One of the trees on Mr. Kratz's place has been planted for twenty-five years, and is approximately two feet in diameter and 35 feet tall, with a spread of fifty-five to sixty feet from tip to tip of branches.

The hybrid between the butternut and the Sieboldiana form grows even more rapidly than either of the pure Japanese species. On the farm of Alfred Smith, Kerman avenue, Grimsby, there is a tree growing under rather unfavourable conditions which is about 30 feet tall and ten inches in diameter at the base at

seven years of age. Mr. J. J. Kelsey of Clinton, Conn., reports one of these hybrids to be 46 feet tall at nine years, and states that trees sometimes bear at three years of age. The hybrid tree appears to be quite hardy, having been grown and fruited at Cap Rouge, near Quebec city. The nuts of the hybrid have a fine flavour, but are not so desirable as the heartnut on account of having a thicker shell which does not crack easily. Its extreme rapidity of growth and the beautiful, almost tropical, foliage, however, make it desirable as an ornamental, to say nothing of the nuts, which are as good as the butternut and are borne in much greater profusion.

The English or Persian Walnut, *Juglans regia*.—The English walnut, or the Persian walnut, as it should be called, is found growing in the Niagara district and to a lesser extent in the lake Erie counties. It is stated on good authority that there are about 100 of these trees growing in the fruit belt between Hamilton and Niagara Falls. There are several quite large trees in the vicinity of St. Catharines, which have borne good crops of nuts. One of these trees produced nuts of sufficient merit to be included in the list of desirable nuts prepared by C. A. Reed, Nut Culturist of the United States department of Agriculture. This variety has been named the "Ontario," and is now being propagated experimentally in the United States.

There is a tree about fifteen years old on the farm of Mr. Peter McDiarmid which produces one of the largest and finest English walnuts I have ever seen. The shell is thin, cracks easily and contains a kernel of excellent flavour. This tree is considered very promising and arrangements are being made to have it propagated. In the vicinity of St. Davids, on the farm of Mr. James Woodruff, there is a fine English walnut tree which produced ten bushels of shelled nuts in one season. This tree is one of the largest of its kind in Ontario. It is about 60 feet tall, has a trunk diameter of three feet at one foot above the ground, and a spread of branches equal to its height. Mr. G. Greeniaus, near Clarkson, has several trees, some of which are bearing well.

The English walnut is not as hardy as the black walnut, and is adapted only to those sections of Ontario where the peach can be grown successfully. At present, this tree cannot be recommended for any part of Ontario except the Niagara district, the Lake Erie counties and possibly the district between Toronto and Hamilton. Even in these districts it should not be planted unless it has been grafted or budded on the hardier black walnut.

Chinese Walnuts, *Juglans regia sinensis*.—The Chinese walnut is being grown experimentally in the northern part of the United States, and has been tried at one place in Canada, *e.g.*, in the grounds of G. H Corsan, Islington, Ontario. The tree is hardy at the Arnold Arboretum, Jamaica Plains, Mass., and should be sufficiently hardy for southern Ontario. It is believed that the Chinese walnut will prove to be hardier than the English walnut, and it may have an important place amongst nut trees in the northern part of the United States and in southern Canada. The nuts are very large and have a thicker shell than the English walnut, but not nearly so thick or hard as the native black walnut. The kernel generally has a fine flavour, being almost as good as the English walnut.

Several lots of nuts of this species were obtained from North-west China and have been distributed quite widely in Ontario for test purposes. From these nuts, trees are now growing at the Ontario Agricultural College, the Vineland Experiment Station, and at

Port Dalhousie, Thornhill and Cedar Springs. We hope these little trees will prove to be hardy enough for our climatic conditions and will produce nuts that are as good as the Persian walnut.

The Shagbark Hickory, *Carya ovata*.—This species is the most valuable of the four native species for the production of nuts. It occurs from south-western Quebec to south-western Ontario, and is found chiefly along lakes Erie, St. Clair and Ontario and along the St. Lawrence river. It reaches a height of 50 to 90 feet and a trunk diameter of three feet. In the open, it forms a few short heavy limbs which make an outline resembling an inverted cone. The bark is rough and shaggy and peels off in long strips which curl up at the ends, hence the name Shagbark or Shellbark. The husk surrounding the nut is very thick and is composed of four sections. The nut has a hard shell, which may be thin or thick, and contains a kernel that is highly esteemed by many people.

In Norfolk county some excellent trees have been located. One of them grows on the farm of Mr. George Sherk, near Carholme, and yields a large nut with a thin shell and a fine sweet kernel. The shell of this nut can be easily cracked with a light tap of the hammer, and may be cracked with the teeth without much difficulty.

The Bitternut, *Carya cordiformis*, the Mockernut, *Carya alba*, the Pignut, *Carya glabra*.—Of these other species of native hickory, the Bitternut has the widest range of any, being found from Montreal westward to the Georgian Bay and southward to the Great Lakes and the St. Lawrence. When grown alone, the tree is rather spreading and open and makes a pretty shade tree. The nut has a very thin shell which cracks easily, but the kernel is valueless as an article of food because of the bitter flavour. This species makes a good stock for grafting with superior types of the shellbark, and offers interesting possibilities in breeding tree crops. Several natural crosses between the bitternut and the shellbark have been found, and some of these are of excellent quality. Some of these crosses are described elsewhere in this paper.

The Mockernut and the Pignut are found in the Niagara district and the Lake Erie counties. The Mockernut produces a large nut with a very thick shell and sweet kernel. Because of the thick shell it is not usually of much value as a nut tree. A few variations of this species have been found, however, which may prove worth while propagating.

The Pignut produces a nut of variable form and size. The usual shape is oval, but some are found which are pear-shaped, and others again are broader than long. The kernel varies from bitter to sweet in flavour.

The Pecan, *Carya olivaeformis*.—The Pecan of commerce is a native of North America, and is found most abundantly in the southern and south-western United States and Mexico. A few hardy types have been found in the northern States. At Burlington, Iowa, there is a large tree which bears good crops of fine nuts, and at Concord, Conn., another large tree has been located, but on this one the nuts do not ripen.

It may be somewhat surprising to most people to learn that pecan trees grow in Ontario. Mr. C. R. James of Richmond Hill, Ontario, has five trees, some of which have occasionally ripened nuts. In 1919 a fully ripened crop was gathered, but since that time the nuts have failed to mature. The largest of these trees is 35 feet tall and about sixteen inches in diameter at the base, with a spread of 35 feet from tip to tip of branches. To mature a crop of nuts the pecan requires a longer growing season with more heat units than are generally found in Ontario, and for this reason we cannot recommend the planting of

the pure species. There are, however, a few hybrids between the pecan and the bitternut which are promising for northern sections, and it is possible that these natural crosses will prove hardy enough for the warmer parts of Ontario at least. If these trees can be grown and fruited successfully in Ontario, they will form a valuable addition to our nut-bearing flora.

Hybrid Hickories.—A few fine types of hickory of hybrid origin have been located and are now being propagated. The Laney, one of the best of these hybrids, was found in Riverside Cemetery in Rochester, N.Y. It is believed to be a cross between the bitternut and the shagbark, The tree is a large, vigorous, spreading grower, with beautiful foliage, and bears a fairly large nut with a thin shell like the bitternut and a plump sweet kernel like the shagbark.

Another good hybrid has been located near Rochester. It is supposed to be a cross between the kingnut and the shagbark, and is said to possess the characteristic large size of the kingnut with the sweet flavour and thin shell of some of the best shagbarks. This cross has been named the *Carya Dunbarii,* in honour of John Dunbar, Assistant Superintendent of Parks at Rochester, N.Y.

The Fairbanks is another promising hybrid between the bitternut and the pecan. The tree grows rapidly and bears a fine large nut with a thin shell and a sweet kernel. It is found in Iowa in sections where the climatic conditions are more trying than in our best fruit districts.

The Sweet Chestnut, *Castanea dentata.*—The Sweet Chestnut is found growing naturally on sandy ridges in that part of Ontario extending from Toronto to Sarnia and southward to Lake Erie. It has been planted outside its natural range and is doing fairly well. At the Central Experimental Farm, Ottawa, there is a fair sized tree, and near Newcastle and Goderich there are a few fine specimens.

It grows to a large size, sometimes reaching a height of 100 feet and a diameter of five feet at the base. When grown in the open, it forms several heavy branches and makes a broad rounded crown, but when grown in a dense stand it makes a tall straight tree.

The nuts are borne in a spiny burr which contains from one to three nuts. Some very productive trees have been found bearing nuts of large size and fine flavour. The flavour of the native sweet chestnut is superior to all other chestnut species.

The native chestnut is subject to a fatal disease called chestnut bark disease. This disease is not known to occur in Ontario, but there is no assurance that it will not eventually appear and, therefore, the planting of this tree is attended with some risk.

Exotic Species of Chestnuts.—Inasmuch as very few Chinese, Japanese and European chestnuts have been planted in Ontario, little can be said regarding their suitability for our conditions. Dr. Sargeant reports the Chinest chestnut (*Castanea mollissima*) as being quite hardy at the Arnold Arboretum. This species produces a large sweet-flavoured nut, and the tree is said to be resistent to chestnut bark disease. The Japanese chestnut (*C. crenata*) is also quite hardy but is very susceptible to blight. A few Japanese chestnut trees are growing near Fonthill and have borne some very good crops. The tree is a small spreading grower, bears early, sometimes at three years, and yields heavily.

The European chestnut (*Castanea sativa*) has been grown successfully at Vineland by Mr. S. H. Rittenhouse. The tree is a low-spreading rapid grower and bears at an early age. The nuts are large, have a

fairly good flavour, and are borne quite abundantly at an early age.

Several Chinese and Japanese chestnut trees and a few hybrids between the two were recently obtained from Mr. Peter Bissett of the Bureau of Plant Industry at Washington. Some of these trees will be planted at the Ontario Agricultural College and the remainder have been sent to the Experimental Stations at Vineland and Ridgetown. It is hoped these trees will be hardy enough for our climatic conditions and will furnish us with material for improving our native species.

Hazels.—The Hazel family is represented in Ontario by two native species, the common hazel (*Corylus americana*) and the beaked hazel (*C. rostrata*). The hazel is without a doubt one of our hardiest nut-bearing plants, being found throughout Canada from the Atlantic to the Pacific, and as far north as Hudson Bay and up to the Peace River district. Dr. N. E. Hansen, Professor of Horticulture, College of Agriculture, Brookings, S.D., has selected some fine strains from Manitoba. These are now being propagated and widely distributed in the northwestern States.

The Filbert (*Corylus avellena*) has been introduced, and some good bushes are now growing and bearing at various points in Ontario. Mr. Graesser, of College Heights, Guelph, has a few bushes which bore well during the past season. Mr. Walter McCall of St. Williams, Ontario, has some fine large Kentish cobnut trees which have been bearing well for several years. Some of these trees are almost 20 feet tall and four inches in diameter. Messrs. H. B. McConnell and Son, of Port Burwell, are also growing the filbert successfully and regard it as a promising nut plant.

From the results obtained in Ontario by the above mentioned parties and at Rochester by Messrs. McGlennon & Vollertson, it would appear that the best hardy varieties of filberts could be grown to advantage in many parts of Ontario where they are not now grown.

The Turkish Tree Hazel (*C. colurna*) is a native of western Asia and southern Europe. In its native land it grows to a height of 60 feet with a wide spread of branches. This tree has been introduced into North America and appears to be quite hardy in northern areas. In Highland Park at Rochester, there is a specimen about 35 feet tall and fifteen inches in diameter at the base, and on the University campus, Toronto, there are a few young trees growing nicely. The nuts are borne abundantly in clusters, similar to the common hazel, are about as large as some of our small fruited hazels, and contain a kernel with a fine flavour. This tree is certainly worthy of a trial as an ornamental, and if a large fruited form could be discovered or produced by crossing with the filbert, it would make an excellent nut tree.

The Beech, *Fagus grandiflora*.—Next to the hazelnut the beech is the hardiest nut-bearing plant grown in Canada, being found abundantly in the Maritime Provinces, Quebec, and throughout Ontario to the west end of lake Superior.

The beech grows slowly and does not bear regularly, and hence has been almost neglected by nut culturists. Where other good faster-growing trees do not thrive, the beech is worthy of planting because of the fine quality of its nuts and beauty of tree.

The Almond, *Prunus amygdalus*.—The hard-shelled almond is grown to a limited extent in southern Ontario. Mr. R. J. Fleming of Watford, Ontario, has a tree which is yielding well, and Mr. Walter McCall of St. Williams, Ontario, has a fine tree which at three years from planting produced one-half bushel of nuts. The growth of this tree is astonishingly rapid, being about five feet per

annum. On suitable soils and in favourable locations the hard-shelled almond should be tried in southern Ontario where the peach can be grown satisfactorily.

Why Nut Trees Should be Planted

Most people who are interested in the welfare of the country realize that trees generally should be planted in much greater numbers, and some believe that it would be desirable to plant trees that serve a three-fold purpose of food, shelter and beauty.

Nut trees yield a valuable food, provide shelter and beautify the landscape, and thus combine beauty with utility. Large quantities of nuts are imported every year from foreign countries, for which a great deal of money has to be sent out of the country. It is believed that a portion of this demand for nuts could be met by growing a greater number of the best types of native and introduced species.

Where Nut Trees Might be Used to Advantage

(1) *As roadside and street trees:* Where the soil and the site are suitable, nut trees should form a part of the scheme of beautifying our highways and streets.

(2) *Trees for the home grounds:* The grounds surrounding many of our homes, both rural and urban, would be more beautiful and productive if planted with some of the best types of native and exotic nut trees.

(3) *Steep hillsides or other places:* Areas not easily or profitably cultivated could be very well devoted to nut trees provided the soil was suitable.

(4) *As park trees:* City and rural parks should certainly have a collection of native nut trees and some of the hardiest and best exotic species.

(5) *As a commercial venture:* In the warmest part of the province of Ontario it might pay to establish, on a small scale, commercial plantations of the best varieties of black walnut, Japanese walnuts, hickories, blight-resistant chestnuts, and filberts.

Kind of Nut Trees to Plant

Nut trees, like fruit trees, are difficult to grow true to type from seed and hence have to be propagated by budding or grafting. While it is quite true that one may get a very good tree by planting nuts from a desirable tree, it is also true that a considerable proportion of the trees so produced will not be any better or as good as their parent. Because of this uncertainty it is much better to plant budded or grafted trees of superior named varieties.

Inasmuch as nut growing is a comparatively recent development, our Ontario nurserymen have not devoted much atention to the propagation of named varieties of nut trees. There is some interest being shown at present, however, and it is hoped that before long there will be a fair supply of the best varieties of native and foreign nut trees available. In the meantime those who desire to secure named varieties of nut trees will have to place their orders with nut nurserymen in the United States.

Should the prospective nut culturist not be able to obtain at a moderate figure budded or grafted stock of improved varieties of nuts then, of course, the only thing to do is to grow seedling trees. As previously stated, some of these may produce very good nuts. If superior trees are found in any lot grown from seed, or if an exceptionally fine native tree is known to exist, such trees are useful as a source of scions for improving trees that are not so desirable. It is a fact, though not generally known, that nut trees may be top-grafted like fruit trees. This task is not as easy to accomplish as is the case in fruit trees, but if proper methods are followed, very good results may be obtained.

THE PROGRESS OF POULTRY KEEPING IN THE PROVINCE OF QUEBEC

By REV. BR. LIGUORI, Chief of the Poultry Division

THREE centuries ago—the exact date being August 26, 1621—the first marriage between Christians in Canada took place in Quebec City, in the church of l'Habitation, built by Champlain. Louis Hébert, first Canadian farmer, and Marie Rollet, his wife, married their daughter Marie Guillemette to Guillaume Couillard. There was a banquet for the occasion at which the whole colony assisted, headed by Champlain. Obviously, this banquet did not include eggs from domestic fowls. The fowls, like the horses, were imported from France several years after this happy event.

Whatever may have been the date of their arrival in Canada, the first roosters and the first hens imported from Sunny France were wintered in rudimentary and dark cabins, made of logs, which also sheltered the horses and the few head of cattle of that time.

Throughout the 17th, the 18th and the 19th centuries, all the live stock of the farm were housed together. Therefore, under the French régime, under the English régime, under the régime of the two Canadas, of Canada under the Union and even under the régime of the Confederation, as far as the beginning of the present century,- horses, cows, calves, and fowls lived together under the same roof and necessarily breathed this heavy atmosphere—viciated, impure, damp air, particularly injurious to fowls, which fear dampness above all things and require sunshine and pure, dry, sanitary quarters.

The Canada of those days was not noted as a great producer of eggs, especially in winter. At the beginning of the last century, the inexperienced traveller, who asked for fresh eggs in a country hotel in November, December or January, would have been considered as very "smart" indeed.

At the beginning of the present century, the late Victor Fortier, of the Central Experimental Farm, Ottawa, began to recommend the cotton-front poultry house, rightly called by the people "the cold poultry house".

The Oka Agricultural School (which has since become the Oka Agricultural Institute) listened to the advice of Fortier and co-operated with him Experiments soon showed that this type of construction was both safe and efficient.

In 1909, the Quebec Farmers' Experimental Union, then in its beginning, with the assistance of the Minister of Agriculture, the Hon. Jos. Ed. Caron, launched throughout the province an aggressive compaign in favour of this type of sanitary poultry house The Union paved the way for the organization of a Poultry Division, which was brought about by the same Minister, and continued the work of its predecessor on behalf of cold poultry houses and poultry-keeping in general, a work of renovation, affecting the whole practice of poultry-keeping. In this work the present Dominion Poultry Husbandman, Mr. F. C. Elford, has had a large share.

Thus, in less than fifteen years, with the help of the good practical common sense of the population, the cotton front poultry house, which was looked upon as a dangerous innovation at the beginning of the century, was introduced and accepted in all districts of the province. The old methods, which had been followed for three centuries, are now being abandoned, prejudices are being overcome

and, to use a popular expression, the cotton front poultry house is "here to stay." It has successfully passed the test of climate in all sections of the province, even where the winters are most severe. The cotton front poultry house is now found from Hull and Amos to Gaspé Point, and from Mistassini and Magdalen Islands to the frontiers of Vermont.

The Poultry Division

The Poultry Division of the Quebec Department of Agriculture was organized in 1914. Sixteen breeding stations, which were to run for the whole year, were established at that time. In several of these stations, co-operative incubators were placed and gave satisfactory results.

A substantial grant was also given to 39 domestic science schools and to the normal schools of Quebec and Montreal, to enable them to establish modern poultry plants. During the same year, the distribution of eggs to school children was also inaugurated, over 1,000 sittings being distributed.

In co-operation with the Cheesemakers' Co-operative Association, which is now the Quebec Federated Co-operative Association, the Poultry Division endeavoured to organize a co-operative trade in poultry produce, through the publishing of circulars and through practical demonstrations given on the spot by our instructors. The great improvement in quality, and the large increase in the quantity of products placed on the market, show that these efforts were successful.

In addition to the publishing of several circulars and pamphlets, thousands of copies of a complete text-book on poultry-keeping were distributed during the year.

During 1915, thirty-three breeding stations were operated. These stations are generally subsidized during two years only, it being thought advisable to remove them to some other district after two years' work, in order to spread the teachings as much as possible. The superintendents of these stations do not receive any pay from the Department.

The distribution of eggs was also continued in 1915 and 1,568 sittings were disposed of. This feature of the work was extended to the Women's Clubs (Cercles de Fermières) with good results. Thus, in Chicoutimi county, in a single month, twelve modern poultry houses were built at the instigation of farmers' wives. It became necessary to increase the number and the capacity of co-operative incubators to satisfy the demand.

Since 1915, steady progress has been maintained. The improvements are as follows:

1. Sanitary housing for fowls.
2. Winter laying, resulting from the above.
3. Early breeding in the spring to insure winter laying.
4. Breeding of utility breeds, the more common of these being the Rhode Island Red, Plymouth Rock and the Wyandotte.
5. Special poultry exhibitions held by poultry associations, of which there are about fifteen at present.
6. Organization of a provincial poultry association with which all poultry associations in the province are affiliated.

For further information on this subject, the reader is referred to annual reports of the Poultry Division.

No mention has been made of various organizations promoted by the Department of Agriculture. As regards the financial assistance given by the latter, with a view to encouraging the improvement of desirable breeds of fowls, let me conclude by quoting a statement made by the Live Stock Commissioner, Mr. H. S. Arkell, at the meeting of breeders

and fairs' associations, held in Quebec city, on May 7 last:—

"I believe that the Quebec list of breeds and prizes for poultry fairs is now the best that can be found, and it appears to me that this special encouragement given to a few breeds of utility, as is now done in Quebec, is the surest and easiest way to succeed. When the province of Quebec decides to do something in agriculture, she at once sets to work and does it."

The distribution of day-old chicks is now a well-established industry, and the demand is almost unlimited. A co-operative establishment in Quebec city, the Belvedere Farm, hatches and distributes every year from 7,000 to 10,000 day-old chicks, and there are five other co-operative plants having incubators of a capacity of 2,400 eggs.

The Breeding of Turkeys

In order to improve the quality of flocks of turkeys, several hundred breeding birds, specially selected, were distributed by the division. A very great improvement, due to this distribution, is already noticeable in the weight and particularly in the hardiness of the flocks where these turkeys were introduced

FIELD CROP INSECTS IN MANITOBA

By A. V. MITCHENER, Assistant Professor of Entomology, Manitoba Agricultural College

AMONG the insects most destructive to field crops in Manitoba are grasshoppers, the western wheat-stem saw-fly, and the Hessian-fly. Spring wheat is the crop that is injured to the greatest extent, although other crops are destroyed, especially by grasshoppers. The farmers who first grew wheat had comparatively little trouble from insects, but as time has gone on, insect injury has become more pronounced. The average annual production of spring wheat in Manitoba for the past five years is around forty-five million bushels; consequently, any insect injuring this crop over a widespread area is capable of causing immense loss to the farmers of the Province

Grasshoppers

Grasshopper outbreaks usually do not extend over a very long period of years. The present outbreak, which is now in its last stages, began almost unnoticed in 1918. The maximum intensity of the outbreak was reached in 1920, and since that time has been on the decline. Several injurious native species were involved. These may be divided into two types, according to their habits. The roadside grasshopper (*Camnula pellucida*) is one type. This made its appearance first, and was found making its way into the edges of the grain fields from roadsides, lanes, headlands, fence rows, etc., where the egg beds were concentrated. The second type includes the lesser migratory grasshopper (*Melanoplus atlanis*), the two-striped grasshopper (*Melanoplus bivittatus*), and the red-legged grasshopper (*Melanoplus femur-rubrum*). The adults of these three species oviposit in cultivated fields; consequently, their attack was scattered through the grain fields and frequently was not noticed as quickly as that of the roadside grasshopper. Wheat, oats, rye, barley, etc., were attacked. The grasshoppers were found most abundant in the older settled areas of the Province, although isolated outbreaks occurred in the newer parts.

The control measures promptly undertaken by the Provincial Government saved the farmers millions of

dollars worth of crop during the outbreak. In 1920, when the grasshoppers were most numerous, it is estimated that over $17,000,000 worth of crop was saved in that year alone. To this amount must be added the value of the crops saved during the other years of the outbreak.

The whole infested area was completely organized by the Provincial Government, and mixing stations were established in towns in the midst of the area infested. At these stations the baits were mixed, and then taken out to the farms by the farmers as required. The Kansas bait was first used, but this ultimately gave way to a less expensive bait recommended by Mr. Norman Criddle, in charge of the Dominion Entomological Laboratory at Treesbank, Manitoba. In this bait common salt replaced the attractants used in the Kansas mixture. The bait now used in Manitoba contains:—

Bran—50 pounds.
Sawdust—Bulk equal to bran.
Salt—5 to 6 pounds.
White arsenic—5 pounds.
Water—Sufficient to moisten.

Early in the work it was found that hand mixing of baits was too slow to handle the volume needed. To cope with the demand for large quantities of well mixed bait, mixing machines were devised. The type that met with greatest favour was operated by a gasoline engine, and had a capacity of several tons daily. The drum of the machine remained stationary when the machine was in operation, and the mixing was done by stirring rods which revolved within the drum. These machines were made locally from pieces of old machinery, and played an important part in the campaign against the grasshoppers.

All egg beds and land infested with egg pods should be deeply ploughed to bury the eggs so far down that hatching will not take place. Ploughing should be done in the fall, if possible. If done in the spring, the land should be well packed immediately.

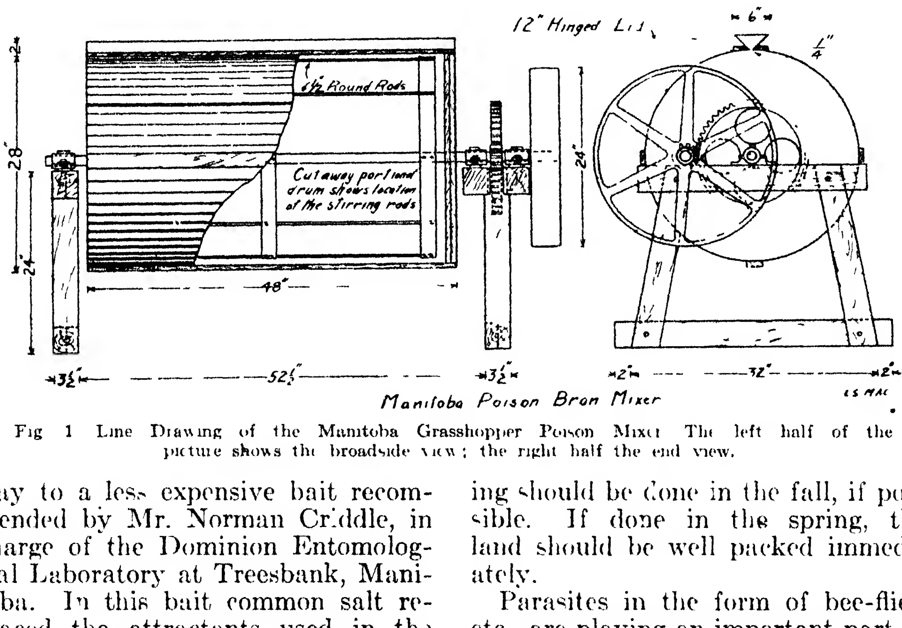


Fig. 1. Line Drawing of the Manitoba Grasshopper Poison Mixer. The left half of the picture shows the broadside view; the right half the end view.

Parasites in the form of bee-flies, etc., are playing an important part in the natural control of grasshoppers at the present time.

Western Wheat-stem Saw-fly

The western wheat-stem saw-fly *(Cephus cinctus)* is also a native insect. Before it began to make its home in wheat, it lived in the native grasses that bore hollow flowering stems large enough to accommodate the larvæ. When this insect first began to invade the crop, it attacked the

grain along the edges of the fields. Now, the grain in the middle of the fields is as badly infested as that at the edges. About 12,000 square miles of the southern and western part of the Province is under attack, and the loss in 1921 was estimated at between three and four million bushels of wheat. Spring wheat, including durum, and spring rye are the only grain crops that have suffered from this insect to date. Fall rye, oats and barley have escaped serious injury.

The western wheat-stem saw-fly has only one brood per year. The adults appear during the latter part of June and early July, and the females lay their eggs near the top joints of the plants which have not yet come into head. These eggs are placed within the cavity of the stem. When the saw-flies are abundant, several eggs may be placed within one stem, and although these eggs may hatch, strange to say, only one mature larva can be found within a stem by the time the grain is ripe. As the larvæ grow, they work downward within the stem, and by the time the grain is ripe, have reached a place about even with the surface of the ground. Upon arriving at this point they chew a V-shaped groove around the inside of the stem. The weakened straw breaks off readily with the wind and the heads are lost. The larvæ winter over in the stubs beneath the surface of the ground. Pupation takes place in late May within the winter quarters, and the adults emerge as stated above.

Fig. 2. An average area in a field of wheat infested with Western Wheat-stem Saw-fly, showing bent and broken stems.

Crop loss is almost entirely confined to those stems that break off before the crop is cut. Samples taken from numerous fields in 1921 and 1922 in various parts of the province showed that the presence of the larva within the stem did not seriously affect the yield and quality of the kernels in the heads. This held true for both Marquis and durum wheat. Farmers who have infested fields are urged to begin cutting early so that

61661—3½

they may be able to finish, if possible, before the crop gets dead ripe, at which time the infested stems fall very badly. This recommendation does not control the insect, but enables the farmer to save at least some of the infested grain.

Co-operative efforts are essential to the successful control of this insect. Just how far the adults will fly, is not known, but it is common knowledge that they will fly across large fields. Experiments have shown that although this insect will emerge through a few inches of soil, very few adults can get up through six inches of earth. Farmers are therefore recommended to plough infested fields in the autumn, burying the stubble six inches deep. We strongly urge the use of the skimmer on the plough. This buries practically all of the stubble deep in the ground. A rotation of crops should be practised, and in the badly infested area no crop should be stubbled in on a field that grew wheat or spring rye the previous year.

The natural parasites of the western wheat-stem saw-fly have not yet been able to attack it in grain, although they do attack it in the native grasses. Whether or not they will ultimately learn to attack it in its comparatively new environment remains to be seen.

The Hessian-fly

The Hessian-fly *(Phytophaga destructor)*, unlike the previous insects, is not a native insect. The first outbreak of any importance recorded for western Canada was in 1899. Again, in 1902, another attack was experienced. Little further injury was observed until 1922, when an area north of the main line of the Canadian Pacific Railway and south of the Riding Mountains was found to be lightly infested. While the wheat-stem saw-fly thrives best in dry areas and years, the Hessian-fly does most damage in areas where more moisture is to be found.

In Manitoba, under favourable conditions, there is one full brood and a partial second brood per year. It is the partial second brood that does the damage frequently attributed to hail. The adult is a small two-winged fly whose maggots, unlike the sawfly larvæ, feed upon the outside of the plant. These maggots, by their feeding habits, weaken the stems near the upper joints. The maggots pupate at these feeding points, the pupæ being called "flax-seeds." The weakened condition of the straw allows the stems to crinkle over. Heads bent over in this way are lost when the field is cut.

The usual recommendations with regard to burning stubble, burning straw piles and destroying screenings are suggested. If carried out, these practices will destroy the "flax-seeds" of the partial second generation. The "flax-seeds" of that portion of the first generation which does not produce adults the same season are found around the bases of the plants where the first brood pupates. These can be destroyed only by deep ploughing. Here, also, the skimmer should be used to make sure that the stubbles are all deeply buried.

On occasion, other insects such as cutworms, white grubs, wireworms, aphis, etc., have done some damage to field crops. Of these, probably cutworms of various species have done and may be expected to do the most damage in future. Fortunately the pale western cutworm has not yet done any harm in Manitoba.

DAIRYING IN SASKATCHEWAN

By PROFESSOR A. E. POTTS, Professor of Dairying, University of Saskatchewan

HE dairy industry in the province of Saskatchewan, still in its infancy, has been showing a steady growth for several years. It has grown in spite of the fact that the dairy cow has not been very popular with the majority of farmers who in many cases came out West with the definite object of getting away from the ties and "chores" that are the necessary adjuncts to a dairy farm. It is much more popular to grow cash grain crops, and on many farms the cow has been and still is conspicuous by her absence. Nature has rebelled, however, and has already shown in many ways that grain crops alone cannot be grown continuously without bringing a load of troubles on the head of the "grain miner." The result has been a gradual change to a more diversified type of farming. This change is being made not from choice but from necessity. The keeping of live stock has increased, and because, in recent years, the dairy cow has proved the most profitable form of live stock to keep, she is rapidly gaining in favour.

An idea of the rapidity of the growth of the industry can be gained by comparing the output of creamery butter in Saskatchewan in the past year (1922) with that produced in twelve months ten years ago. In 1912 the total production was reported as 1,009,604 pounds compared with 8,901,105 pounds in 1922, an increase of 78 per cent in ten years. If we look still further back, we find that ten years previous the production was almost nil. Notwithstanding this rapid growth, the industry is still very small for a province that has 94,000,000 acres of land capable of cultivation, and the possibilities of increase are very great. This very newness has had the effect of placing the industry on a good and solid foundation, since it has been possible to control and direct development along sound lines. The result is that now, although still being far behind in volume of production, Saskatchewan along with the other prairie provinces, leads the Dominion in methods and in the quality and uniformity of the butter produced.

Where an industry has been established for a long time and where the procedure has become set and uniform, it is difficult, when changes are found necessary, to make the required adjustments in equipment and methods. The creameryman starting in the West has not been confronted with this difficulty, and has been able to start with a clear field. It has therefore been much easier under these conditions to start the new creameries operating on a proper basis, and to ensure that they continue to develop on approved lines, making use of all the knowledge that has been already gained in other parts. The results of this are very apparent and striking, and many problems, still very acute and hard to solve in the older provinces, have hardly existed in the West, or, if they have, their solution has been much simpler.

Consider for example the question of the pasteurization of cream for buttermaking. The value of this has been proved beyond dispute, and the practice is by no means universal in the Dominion. It is costly and sometimes difficult to change an old plant over so that it may be equipped to pasteurize cream for churning. This is particularly true with plants where the "make" is small and often not sufficient to carry the necessary increase in overhead charges. Because of this and other minor reasons such as conservatism,

the change is slow and difficult to make. In Saskatchewan this problem does not exist as all creameries are equipped for pasteurization and no raw butter is made. This one factor in itself is a great help to the butter trade since it ensures that only one kind of creamery butter is made, namely "pasteurized." This is the first and a very important step towards uniformity of quality, which is an absolute essential if the product is to be marketed profitably.

Again, wherever butter is made from gathered cream, and this applies to most parts of Canada and the United States, the quality of the cream sent in by the farmers presents an ever-present problem, since the quality of the final product is absolutely dependent on that of the raw material. There is, therefore, a constant endeavour to raise the standard of cream shipments. All creamerymen recognize that cream of a high quality has a greater cash value to them than the lower grade article, and they are all willing and anxious to recognize this extra value by paying more for it, so as to encourage farmers to ship cream of the highest quality.

This sounds very logical and simple but it is a difficult matter to put into practice. If an individual plant starts to pay for cream on the quality basis, the result will simply be a loss in business since the patron who is given the lower grade will immediately send his cream elsewhere. Several attempts have been made by groups of creamerymen to work on a "gentlemen's agreement," but this system has never proved entirely satisfactory, and in some cases the results have been almost disastrous for the operators who have lived up strictly to their agreements.

A solution has already been found for this problem in the West. At the request of the parties concerned, the operators, the producers and the Provincial Governments of Alberta, Saskatchewan and Manitoba have passed legislation requiring that all cream bought for butter making shall be paid for on grade according to fixed standards, and on May 1 of this year, official government graders were located at the butter-making plants in the three provinces to enforce these regulations.

The new system will undoubtedly have far-reaching effects and will do much to stabilize the industry. The producer will ship with more confidence, knowing that his cream is being graded by a third party who is disinterested, and a great source of discontent will thus be removed. The creameryman will know that he can pay more for a good article and less for a poor one without risk of losing his business, and the result of these two factors will be that the grade of cream shipped will undoubtedly improve, with a resulting improvement in the quality of butter manufactured. This in turn will react on the price obtained on the market, which will mean, in short, that the returns will be greater both to the producer and to the manufacturer. It is believed that this increase will more than offset the cost of operating the grading service.

Although this development and progress have been made possible by the newness and relative smallness of the industry, they have not arisen spontaneously, but have been to a very considerable extent the result of careful direction by the various agencies whose business it has been to help and foster dairying.

A factor that has contributed much in gaining these ends has been the establishment of the Provincial Butter Grading System, conducted by the Dairy Branch. The usefulness of this service is proved by the fact that it is taken advantage of to such a great extent by the manufacturers of the province. Although the grad-

ing of butter is quite voluntary, over 90 per cent of the total creamery butter made in Saskatchewan in 1922 was graded by provincial graders. An important point in this connection is that no grade certificates of any kind are given on a sample of butter made from unpasteurized cream, and all samples are carefully checked by the Storch test before certificates are issued. The result, as already mentioned, is that practically no raw creamery butter is made in the province. It should be noted that in the recent Dominion legislation, which made compulsory the grading of all butter for export, it was not possible to insist on all samples being pasteurized since it was considered that this would impose hardship on the many plants in the East which are not yet equipped for the purpose.

In addition to this service, the dairy branch makes its influence felt in the province through the medium of field men amongst whom are included promoters of cow-testing associations— by assisting the Provincial Dairy Association, and also through the head office, which, in addition to handling its ordinary routine work, acts as a central information bureau, collecting and broadcasting all useful information on dairy topics as soon as it comes to hand.

At the Dairy Department of the Provincial University at Saskatoon the policy has been to work hand in hand with the Dairy Branch at Regina, with the same objects in view, namely, to promote a steady and stable increase in the dairy production of the province. Special attention is given to economy of production, to the emphasizing of the necessity for producing a raw material of high quality, and to teaching the best methods of doing this, to the end that the final products reaching the market will be of the highest grade possible.

The work at the University Dairy Department is divided into three phases—instruction, extension, and experiment.

With regard to the first of these, the Department is well equipped to give instruction, both practical and theoretical, on the care, handling and testing of dairy products, cheesemaking and buttermaking under farm or factory conditions. Up to the present, not much time has been devoted to the training of dairy specialists, although the demand for this is growing. More time is given to instruction of a more general nature.

All students in agriculture take at least one full course in dairying. This course goes into the subject as far as the time available permits, and aims to give the students a general understanding of the field of dairying.

The Department conducts extension work through the medium of correspondence and extension lectures. Large numbers of people are reached annually in this way.

As to experimental work, the problems of greatest interest in the province at this time are chiefly those related to the manufacture of butter, since this is the only form of dairy produce exported to any extent. Cheese is made only in very limited quantity and is therefore of little importance as yet. In view of this situation the Department has been engaged during the last two summers in conducting experimental work on buttermaking problems. These have dealt chiefly with factors affecting the keeping quality in storage.

Perhaps one of the healthiest signs is the strong spirit of co-operation existing between producers and manufacturers. This finds a prac-

tical outlet in the Provincial Dairy Association, an organization serving the interests of both parties conjointly. This is as it should be, since it is obvious that all problems are mutual, and that the welfare of the producer and the manufacturer are entirely interdependent.

The great event of the Association's year is the annual convention. It has been the policy of the directors to promote impromptu discussion rather than to prepare an elaborate programme of set speeches. As a result, these conventions have been very successful, and much useful and practical discussion on present day problems has taken place.

Of the many useful competitions being conducted two may be singled out as being particularly important. A Greater Average Production competition is conducted to encourage the work of cow-testing. Interest in this work is growing very rapidly, and some at least of this increase may be justly credited to this competition. However, the most important work being done by the Association is that in connection with the boys and girls. Boys' and Girls' Judging Competitions are held annually and are very popular. The breeders of the province have been very generous in donating prizes in the form of pure-bred young dairy stock. At the convention held in February of this year, the tangible results of this were shown when three young girls and one boy, who had taken part in the competitions, gave short talks and demonstrated to their elders that they had a clear and sound outlook on the question of dairying, and that they appreciated the value of a good dairy cow.

With an industry in such a healthy condition, with a spirit of co-operation and mutual confidence existing between producer and manufacturer, and with a younger generation showing such keen interest and promise, there is little room for doubt about the future of dairying in Saskatchewan.

ONTARIO'S BETTER LIVE STOCK TRAIN

By L. STEVENSON, Secretary and Supervising Director, Department of Agriculture

THE Ontario Better Live Stock Train of 1923 was organized by the officials of the Live Stock Branch of the Ontario Department of Agriculture, assisted by the officials of the following organizations: Dominion Department of Agriculture, Industrial and Development Council of Meat Packers, Ontario Live Stock Association, the Canadian Pacific Railway, and the Canadian National Railway.

The train was made up of sixteen cars, eleven of which carried live stock for demonstration and sale. A lecture car and staff maintenance cars completed the train.

During March the train made twenty-one all-day stops (9 a.m. to 10 p.m.) and twelve half-day stops. During April, twenty-one all-day stops and four half-day stops were made. The total number of actual farmers visiting the train during the period was 37,600. The number of school children that were conducted through the train by officials and teachers was 6,500. Lecturers, demonstrators and salesmen were continuously on duty in the various cars, and dealt with the varied inquiries of the visitors.

Educational Features

The swine cars were specially fitted to make demonstrations in swine grading possible, and give the farmers throughout the province a

clear idea of the type and conformation required for the different grades of hogs under the new grading regulations. Representative hogs, with the corresponding cured Wiltshire sides, were used in this demonstration. For the convenience of farmers desirous of purchasing young breeding stock of the bacon producing type, a carload of boars and sows from six to eight months of age was included in the train. Many sales were made, and good type young breeding stock left the train for new homes at every stop. The supply of stock was replenished at various points along the line of travel by previous arrangement.

Poultry Keeping

The poultry car was fitted out to demonstrate the most approved methods of selecting, feeding, housing and preparing poultry and poultry products for market. In the exhibit were included live birds showing desirable types for egg production and also those for meat production. Culling demonstrations were given throughout the day, being illustrated with living specimens and skeletons. Models of poultry houses and equipment, and of hatching and brooding devices, occupied a prominent position in the exhibit. Poultry nutrition was illustrated in an attractive way through the use of coloured transparencies, giving rations used in chick rearing and the results. The Canadian Egg Standard was well illustrated by a continuous candling and grading demonstration. Killing and plucking, as done by the expert in charge was a revelation to many, as the loosened feathers were stripped from the bird in the short space of one minute.

Dairying

The dairy cow car contained good grade cows, representing the Holstein, Jersey, Ayrshire and Shorthorn breeds. These animals were selected to show the influence of pure bred bulls, and demonstrate the high degree of excellence that may be obtained by careful breeding. Demonstrations and lectures were given on these cows, with special emphasis on type and conformation as associated with high class cattle. Ayrshire, Holstein, Jersey, and Gurnsey bulls were offered for sale at cost. These bulls were selected for their excellence of type and the production of ancestry. A number of young bulls were sold at the various stops. A dairy lecture was given each afternoon in the lecture car, dealing with feeds, herd improvement, and the rearing of young stock.

Sheep and Wool

In the sheep and wool car, a very attractive exhibit was presented, prepared by the Provincial live stock men, co-operating with the wool growers, the breeders and the woollen mills. Typical fleeces of the principal grades of Canadian wool were shown and used in demonstrating the various grades, classes and purposes for which each was used. The preparation of wool for market was strongly emphasized. Samples of cloth, knitted goods, blankets, and yarn made from Canadian wool by Canadian mills, were shown and described. A number of live sheep were carried and suitably displayed, emphasizing the best breed types and market classes Lectures were given on breeds, breeding, judging, and the care and management of the flock. Two pens, one showing the progeny of a good type pure bred ram and another showing the progeny of a grade ram, attracted considerable interest through the lesson of superior lambs from the pure bred shire. A full line of shepherd's tools and sheep-fold requirements was shown, and explanations or demonstrations in the use of same were given by the officials in charge.

Beef Cattle

The beef cattle exhibit consisted of a display of steers illustrating market grades and type improvement through the use of pure bred sires. The Ontario Agricultural College supplied a number of animals from a breeding experiment that has been under way during the past two years, so that the farmers of the Province could see for themselves the result of good breeding, coupled with proper care, feeding and management. From the five cars of bulls for sale, many sales were made. Buyers were looking for quality, and appreciated the guarantee and the likelihood of getting a good bull when purchasing from the government. To indicate the type of farmer that the lessons taught by the train was reaching, it can be said that, out of the first fifteen bulls sold, all but one went to farms where the owner had not previously kept a pure bred sire.

The demonstration train attracted and enlightened farmers who hitherto had been disinclined to admit the advantages of pure bred sires and of better live stock.

COW-TESTING RESULTS IN BRITISH COLUMBIA

By G. H. THORNBERY, Assistant in Charge

IT is now eight years since the first three Cow-Testing Associations were organized in the province of British Columbia for the purpose of helping the farmer to increase the average production of his herd through intelligent methods of breeding, feeding and weeding.

The results of this work, as shown in the accompanying table, clearly illustrate what has been accomplished by members of testing associations in different parts of the province. The average herd of 10 cows on test to-day is yielding as much milk and fat as 12 cows were yielding eight years ago. It should be remembered that this is an average, as many herds show a much larger increase.

SUMMARY OF RESULTS OF EIGHT YEARS' COW-TESTING, 1915 to 1922

Average Yield of All Cows Reported

Year	Lbs. Milk	Average per cent Fat	Lbs. Fat
1915	6,517	4·07	265·2
1922	7,073	4·47	316·0
Increase..	556	0·4	50·8

When it is remembered that the approximate annual yield of the average cow in this province is 4,500 pounds of milk containing 160 pounds of butter fat, the value of cow-testing work to all dairymen that are taking advantage of it can be readily appreciated. To briefly illustrate:-

To produce one ton of butter in one year, 11 average British Columbia cows would be required, whereas only six average cows in the testing associations would be necessary. This means a direct saving of the maintenance rations of five cows for 365 days, or of 1,825 days' maintenance for one cow, as well as avoiding the labour involved in milking five cows twice a day for 10 months, or a total of 3,000 milkings.

The average dairy farmer with the average cow of the province requires nearly twice as many cows to produce a stated amount of butter in a given time as the dairyman who is a member of a cow-testing association.

Records of production of about 2,000 cows are being kept by the five

associations now in operation These are situated at Chilliwack, Comox, Langley-Surrey, Kelowna-Vernon, and Richmond-Ladner Owing to an unfortunate lapse in testing operations in the Richmond district during the early part of 1922, no complete reports have been received from that association for the past year

The results of the work of the other associations for the year 1922 are here given:—

CHILLIWACK COW TESTING ASSOCIATION

Breed	Average Lbs Milk	Average % Fat	Average Lbs Fat
Jersey	6 554	5 37	351 8
Ayrshire	7 113	4 39	312 7
Holstein	8 737	3 [illegible]	324 0
Guernsey	6 841	4 4	301 6
Shorthorn	8 1[illegible]9	3 [illegible]6	308 0
Average	7 33[illegible]	4 38	3[illegible]1 4

COMOX VALLEY COW TESTING ASSOCIATION

Breed	Average Lbs Milk	Average % Fat	Average Lbs Fat
Jersey	5 942	5 29	314 3
Holstein (1)	7 032	4 96	348 8
Ayrshire	4 958	5 01	248 5
Shorthorn	6 287	4 62	290 8
Average	5 94[illegible]	5 27	313 5

LANGLEY SURREY COW TESTING ASSOCIATION

Breed	Average Lbs Milk	Average % Fat	Average Lbs Fat
Ayrshire	5 152	4 04	[illegible]
Shorthorn	6,239	4 14	2[illegible]
Guernsey	8 127	4 15	362 [illegible]
Jersey	5 283	5 01	264 6
Holstein	8 340	3 53	[illegible] 0
Average	7 639	3 75	2[illegible] 0

OKANAGAN COW-TESTING ASSOCIATION

Breed	Average Lbs Milk	Average % Fat	Average Lbs Fat
Guernsey	9 329	4 67	464 1
Ayrshire	9 042	4 27	385 4
Shorthorn	5 805	4 49	260 8
Jersey	6 152	5 47	[illegible]36 [illegible]
Holstein	9 10	3 71	[illegible]46 3
Average	8 724	4 05	[illegible]3 6

PART III

Agricultural Education and Related Activities

AGRICULTURAL INSTRUCTION IN SECONDARY SCHOOLS

By J. W. GIBSON, M.A., Director of Elementary Agricultural Education, British Columbia

SECONDARY schools may be regarded generally as being intermediate between the public schools and the college or university. They are represented in Canada chiefly by our High Schools and Collegiate Institutes.

From the very beginning these secondary schools have functioned as preparatory schools either for those entering the university or for those about to enter the Normal School in order to complete their training as teachers. Hitherto they have given but little attention to the training of "teen-age" boys and girls whose plans take them neither into the university nor into the teaching profession. It is true that in recent years secondary school courses have been considerably broadened by the introduction of commercial courses, courses in household economics and also in agriculture. Such courses have been long overdue in our Canadian High School and this fact accounts in some measure for the establishing of special schools in which the courses offered have a more definite bearing upon the industrial life of the people. We have now, for example, in many of our cities what have been termed technical schools and also, in a few of the largest cities, certain kinds of trade schools which are more strictly vocational in their character. Similarly, instruction in agriculture below college grade is now being offered in special vocational schools of agriculture here and there in Canada.

There exists in the minds of many people some misconception as to the nature and purpose of high school courses in agriculture. So many people regard the study of agriculture in one light only, viz., as a desirable preparation for intending farmers, fruit-growers, dairymen, etc. Quite naturally they view with a certain amount of suspicion and distrust the teaching of agriculture in the ordinary High School, and are too ready to criticize it as ineffective and superfluous. They do not believe that high school boys will ever become farmers anyway, agriculture or no agriculture. This is the attitude of mind that one finds predominant throughout Canada forty or fifty years ago, and which still persists to a degree.

Nevertheless, the number of level-headed farmers in Canada who believe that a good education is as essential to a good farmer as it is to a good anybody-else has grown apace, and not many will now be found who would support the view recently expressed by a young druggist in a mining town who with great assurance stated that farmers' sons and daughters were getting "too much education". Perhaps they have been getting too much—of a kind—that kind for instance which he and others of his professional (?) stripe have been receiving for the last half century,

and which farmers have largely been called upon to pay for. No, if there is one occupation under the sun which calls for men of highly trained intelligence, skill and personal qualities of a high order it is farming.

But it is a mistake to assume that agricultural instruction is desirable for farmers or intending farmers only. Many of our merchants, bankers and professional men who have, at some time, availed themselves of the opportunity of studying agriculture in secondary schools and colleges can readily testify as to the value of such study, even as part of a good, sound general education. Indeed, it would be difficult to find another field of study that possesses so much of intimate and genuine interest for the masses of the people, whether living in the city or in the country, as does the study of agriculture. It includes all the experimental and biologic sciences and gives them their daily application in the intricate processes of food production. Its study tends to make things which had been accepted as commonplace, uncommon by virtue of the new light shed upon them. Its study well repays the economist, the publicist and the statesman. Teachers above all, and preachers also, should be close students of agriculture. Indeed, our own national prosperity depends in no small degree upon it.

If the study of Agriculture, therefore, in its broadest sense, is to be brought within the reach of the masses of our young people and is to have the free scope which its importance educationally as well as vocationally warrants, it must be given a more prominent place in our present High Schools as these schools are, for years to come, the only ones which can hope to reach the masses of "teen-age" boys and girls throughout the country. It is not too much to hope for, and even to insist upon, that all high schools should have a science and agriculture department. The narrow and erroneous view that the study of agriculture is something that should concern rural schools only has already been effectively answered in practice. Two of the most successful classes in agriculture in the Province of British Columbia are to be found in the High Schools in the cities of Victoria and New Westminster, and no doubt there are other provinces where similar cases could be cited. Indeed there are very good reasons for encouraging the study of agriculture by boys and girls in our city schools. Be that as it may, there can be no doubt as to the wisdom of establishing courses in Agriculture in all high schools that draw students from agricultural districts, and obviously that is the first point of attack.

It will not do to assume either that students in high school who choose agriculture as one of their options do not intend continuing their studies in the University. All the really enlightened and up-to-date universities in Canada have already made Agriculture a subject for matriculation (other universities please take note!). There is ample evidence in western universities at the present time to show that students who were given the opportunity to offer agriculture for matriculation and who have continued their studies in the faculties of Arts and Science or Agriculture are by no means the lame or maimed or halt or blind members of the undergraduate flock. Speaking generally, these students exhibit certain qualities of resourcefulness and breadth of understanding not to be met with in the average high school graduate—and there is a reason.

It is not sufficient either that High School courses in Agriculture should be pre-eminently educational and nothing more. I shall speak now of my own province and say that they are also eminently practical. So many people, many of whom should know better, regard "practical" as the

equivalent of "vocational" when speaking of agricultural instruction. It depends largely on the method of instruction followed as to whether a subject is of any "practical" value no matter what that subject may be. The book method of teaching agriculture has long since been discredited. The pity is that such a method ever existed. The failures of the past, and they have been many, in the teaching of agriculture from a prescribed text-book have helped to delay the real teaching of the subject by at least half a century. It need hardly be mentioned here that the direct method of instruction whereby first-hand knowledge is gained through experiments in laboratory, field and garden and where the project method is followed is the only method that can meet the needs of the situation A glance at any of the examination papers in agriculture set for high school students would clearly indicate that the instruction given in these schools if successful at all from the standpoint of the promotion of the students must be practical.

The American schools at the present time are making much of the term "vocational agriculture" as the funds provided by the federal government of the United States under the Smith-Hughes Act are for the teaching of "vocational agriculture". It is a matter of common observation that instruction in Agriculture in many of the American schools although professedly "vocational" has really less vocational value and content than that given in most of our Canadian High Schools where the main purpose is not vocational at all.

There are about half a dozen or more special Schools of Agriculture in Canada at the present time. Perhaps they might better be termed junior colleges of agriculture as they aim to do substantially the work of the freshman and sophomore years of the faculty of agriculture. Without doubt these schools are giving excellent courses to their regular students, the young men and women who attend them for about five months in the year, and they also perform a valuable service in providing during the winter months short courses in agriculture for farmers of the district, but they would seem to be hampered by the same limiting factors that our regular agricultural colleges have experienced. The initial outlay in land, improvements, buildings, stock, etc., is excessive, and the maintenance costs for instructors and general upkeep is also high. The great majority of the students attending these schools have to leave home for the five months and have to meet living expenses as if at college. These circumstances do not detract from the value of the work done in these special schools or junior colleges of agriculture, but they do militate against their wide adoption Many a bright and capable boy who would profit by such a course of training cannot be spared from home for such a long period, and not infrequently the parents can ill afford to spend the necessary money to send him. It would seem, therefore, that valuable as these special schools may be they cannot hope to provide agricultural instruction for the masses of the people. In the richest and most highly developed agricultural districts a limited number of these special schools of agriculture might be established and successfully maintained, but for one such school that might be so established there are already established and at hand a dozen high schools that need to be maintained in any case. Why then should we in Canada not make a better and wider use of these already-established secondary or high schools by adding to the staff of each a specially qualified instructor in agriculture, and offering to the boys and girls attending a thoroughly practical as

well as a broadly educational high school course? Too long and with too great cause has our system of higher schools been stigmatized as out of touch with the life and needs of the people, and especially of the rural people. The wishes of the people who support these schools are daily becoming more articulate, and the demand for a system of secondary schools that have something of real value to offer to the boys and girls of industrial and agricultural communities, other than that too vague and undefined thing called "a good general education," will soon become too insistent to remain unheeded. Special schools of agriculture and trade schools can scarcely meet the situation. Whilst they will claim their hundreds and will do excellent work of a special agricultural and industrial character, our regular high schools will claim their thousands, and with the proper adjustment of their curricula, will combine the cultural and humanistic in education with the industrial and the practical, which to many may also incidentally become the vocational.

It is also to be hoped that in addition to the courses in our High Schools just referred to where agriculture is included as one of the options either for matriculation or for teachers' courses, there will also be established winter term courses for boys and girls of high school age who are not in regular attendance. Such courses might run for four or five months and would be specially organized to suit the needs and the interests of these young people. The local high school and its complete equipment would be made available for the carrying on of these winter term courses and the regular High School staff aided by one or more special instructors, as required, would handle the work. Indeed these courses would soon become a strong feature in the service of the high school in much the same way that summer sessions have been established by our universities. The time has passed when High Schools can be regarded as existing only for those young people who have attained to certain arbitrary standards in connection with the elementary school course. They should be and must be open to all young men and women within certain limits of age and mental ability who wish to, or who can be induced to attend even for a short period during the year. To some extent in all high schools, but more especially in the rural high schools, suitable courses in agriculture and domestic science would be provided for regular students as well as for winter term students and as a result our high schools would become "the people's schools" in a manner and to a degree hitherto unknown.

AGRICULTURE IN HIGH SCHOOLS, ONTARIO

By Dr. J. B. DANDENO, Inspector Elementary Agricultural Classes

THE chief object in view of introducing and establishing classes in Agriculture in High Schools in Ontario is to provide a broader education more intimately associated with the welfare of the individual, his family and his country. This statement is intended to imply that High School education of ten or twenty years ago was narrow, because too directly connected with events, opinions, and dealings of the past, and not enough with matters having to do with the immediate environment of the individual. That sort of education of ten or twenty years ago, had its roots in the middle ages when language by written signs was the ad-

miration and the wonder of the people, and in control of a very few. These few soon realized the tremendous advantage this situation would be to them if it could be continued and consequently centres were established to which those who became skilled in written language were attracted—such centres as Greece and Rome. Oxford and Cambridge in England in early days were similar centres where Greek, (perhaps Latin) constituted the whole curriculum. Of course a knowledge of the written language provided a means of acquiring some acquaintance with the thoughts, habits and ideals of people of earlier times. We have this academic education with us yet, though it has been improved and advanced immensely by the addition of Mathematics, Art and Science. These have been introduced very slowly, only a little at a time,—opposition by those skilled in Greek or Latin being difficult to overcome. It took hundreds of years to secure any recognition for Science as a subject worthy of a place on the curriculum. Mathematics were made use of much earlier, but it was always regarded as of little or no application to the walks of life. It was made as inapplicable as possible. The " savants " could " corner the market " more thoroughly and keep education within the cloister and monastery, only in case the scheme of education was kept as far as possible away from the practical.

These things are mentioned because, to a large extent, our present High School education is influenced by Greek and Latin language and history, and people have so long been led to believe that these things and only these can properly be called education, that a subject such as Agriculture is not regarded as worthy of a place beside these subjects.

The aim is, therefore, to introduce Agriculture to the High School Course of Study, claiming that it has educational value, no less suitable than several other subjects, for the purpose of developing an individual and creating in him a power to think, and to appreciate his environment. Elementary Science has already paved the way to a very great extent, but the High School buildings, ground and equipment have never been provided with any other end in view than that book education—education through printed language, is the only education fostered by the school. But this difficulty is relatively unimportant as compared with the attitude of people, of Boards, and of Teachers.

The aim is not to make Agriculturists by teaching Agriculture, but rather to educate them by means of fundamental things, agricultural things—the raw material of food and clothing.

Is it less educative to handle, experiment with and think about soil than to think about and study over an ablative case in Latin or a battle in ancient Greece? In fact, because of the close connection between the individual and the soil it can be even more educative. This is the aim,—to introduce a subject more closely related to the experience of the individual, whether the individual ever becomes an Agriculturist or not, though there is little doubt that, educated in this broader way he will be more likely to make his living on the farm than if taught Grammar, Literature and Mathematics exclusively. It must not be forgotten that it is during the High School period that aptitudes are developed, habits formed and tastes are acquired. The aim is educative rather than vocational.

Policy Pursued

The policy to be undertaken must be developed with a view towards overcoming the difficulties—especially those outlined in the preceding paragraph. The very first thing to accomplish is to secure teachers, not only with some knowledge of Elem-

entary Agriculture, but also with some sympathy for the subject itself. If we had fairly good teachers we are reasonably sure of success, if an opportunity is given to carry on in a High School.

In order to secure an opportunity to introduce the subject into a High School an inducement is offered to the Board by way of a legislative grant, to repay the Board for expenditure made. The teacher also receives a grant in money depending on the extent to which classes in Agriculture are carried on in the school in which he is teaching.

Provision is made whereby a teacher may prepare himself to teach Agriculture,—(1) by taking the Summer Session now offered at the O.A.C., two sessions of five weeks each being required in order to complete the course; (2) A graduate of the O.A.C. may also qualify himself to teach Agriculture (and other subjects) in a High School by attending the College of Education for one year. To be admitted to the College of Education such graduate must have, in addition to his O.A.C. course, the standing of Honour Matriculation.

Up to the present very few teachers have qualified under either method, and, until a supply of teachers is secured, progress will be slow.

With respect to the course of study in High Schools, a step in advance has recently been made whereby Agriculture may be taken as an option with Elementary Science throughout the Lower and the Middle Schools. But, owing to the lack of teachers and to the general antipathy to the subject itself on behalf of teachers and others, progress has been slow.

The policy is to encourage by a gradual process of education rather than by regulation.

Method of Treatment

In order to teach Agriculture in High Schools it is necessary to have some general understanding with respect to the scope and nature of the work to be carried on under the heading "Agriculture." A common notion, especially among farmers, is that agriculture, and farming are synonymous terms, and they reach the conclusion that if farming is to be taught, there must be a farm on which to work. Some modification of this view is necessary, and the conclusion now reached is that agriculture and farming are two subjects, -agriculture dealing with the sciences directly connected with it and "farming" concerned with the actual operations involved in making a living on a farm. This distinction is recognized as a basis on which to arrange a course of study. This being the case, laboratory, and plot, neighbouring institutions such as a dairy farm, a poultry plant, a fruit orchard and the like, are the bases of accommodation for carrying on such work.

As the work of such a course of study is a part of the regular school work of the High School pupil, it is incorporated into his system at a time when lifelong impressions are made. It becomes a part of the scheme of thought of the pupil and, whether he, or she, finds it advisable or necessary to live in the country, the knowledge gained and the impressions received will have a lasting influence.

In order to secure a suitable type of work for the pupils, no text book is prescribed. The course of study is to be carried on by means of individual laboratory work with instruction by the teacher and by the aid of reference books and other publications. There is always a danger when there is a regularly prescribed text book. The work has a tendency

to be made book work, omitting much that should be taken.

It will thus be seen that Agriculture, as indicated in this method, is not vocational, though it is expected that, as time goes on, courses much stronger in Agriculture can be given. This will not happen, however, until we have in our High Schools some principals and assistant teachers holding the degree of B.S.A. But all of this takes time.

To show one of the changes coming to pass in the High Schools and Collegiate Institutes during the past twenty years, it might be worth while to point out the change of viewpoint of the people with respect to the teaching of Science. In 1893 eight per cent of all the Principals of High Schools and Collegiate Institutes, who were Specialists, were Specialists in Science, and in 1921, twenty-six per cent.

Progress and Development

All educational movements which are worth while, are necessarily slow. Agricultural education is no exception. Looking back over the past twenty-five years and noting the steady and pronounced development in the teaching of science in High Schools, we have a right to feel a certain degree of encouragement. Progress has not been rapid for the reasons previously indicated, but very important changes have been going on underneath the surface as it were, with respect to the attitude of the people concerned, and with respect to the content of the work possible in a High School.

On account of the tremendous breadth of the field covered by the term agriculture, it is not surprising to see that there is a great variety of opinions about the subject and its possible place on any course of study. Some people contend that it is not a suitable subject for a High School pupil, while others contend that Agriculture is really not a subject at all, but a list of subjects. Still others, more particularly men of the city, express the idea that even if agriculture were a subject suitable for a High School course, only those connected with the farm should take that subject, or, to put it in another way- agriculture is only for those brought up on a farm. Even among educationists it is not uncommon to find those who assert that, even assuming Agriculture to be a suitable study for boys and young men, it should be carried on in special schools —agricultural schools. This view has had the strongest backing of all. In fact it has been acted upon in other countries, notably in certain states of our neighbouring country. The chief difficulty in carrying on an agricultural education in such schools is that, for boys of limited means, such a course leads only to the position of hired man on a farm. Boys will not readily be attracted to such a school as will lead only to the farm. This view omits to take into consideration the fact that agricultural education is education. In Ontario we are holding to the view that agricultural education is education, as far as it goes, and that as a subject it is worthy of a place on the regular curriculum of High Schools. It is also suitable for boys whether of country or of city, and even for girls.

To make progress in the establishment of the subject on the High School curriculum, it is necessary to consider all of these views, and this is no easy matter, especially if it is expected that they be consolidated into a workable scheme. This, however, has to be done.

FAMILIES OF GRADUATES IN AGRICULTURE

THE Principal of Macdonald College, Dr. F. C. Harrison, gives the following instances where several members of the same family have completed degree courses at that institution and elsewhere. The most notable example is that of the family of Mr. John Newton -living until recently at Ste. Anne de Bellevue, Que.—where five children, three boys and two girls, each completed B.S.A. courses at the college. Four of them also hold the degree of M.Sc., while three already hold the Ph.D. degree, and the other two are at present taking courses leading to that degree. The records are as follows: —

Newton, Robert
B.S.A., McGill, 1912.
M.Sc., Minnesota, 1921.
Ph.D., Minnesota, 1923.

Newton, William
B.S.A., McGill, 1914.
M.Sc., University of California, Berkeley, Cal., 1921.
Ph.D., California (in course).

Newton, John D.
B.S.A., McGill, 1917.
Ph.D., University of California, 1922.

Newton, Margaret
B.S.A., McGill, 1918.
M.Sc., McGill, 1919.
Ph.D., Minnesota, 1922.

Newton, Dorothy Elizabeth
B.S.A., McGill, 1921.
M.Sc., McGill, 1922.
Ph.D., McGill, (in course).

Both parents formerly took short winter courses at the institution.

Other instances where two or more members of a family have graduated from Macdonald College are:—

Fiske, K. M.,	1912
Fiske, S. M.,	1912
Fiske, H.J.M.,	1914
Fiske, R.C.M.,	1917
Hay, G. C.,	1916
Hay, W. D.,	1920
Hay, A. L.,	1921
McOuat, J. E.	1915
McOuat, J. Harold	1916
Matthews, Victor,	1913
Matthews, A. F.,	1920
Matthews, G. D.,	1921
Ness, A. R.	1912
Ness, J. E.,	1920
Ness, R. B.,	1922
Jones, W. N.,	1920
Jones, A. R.,	1921
Reid, R. J. M.,	1918
Reid, W. J.	1920
Schafheitlin, A. O.	1914
Schafheitlin, R.,	1916
Skinner, S. G.,	1920
Skinner, C. T.,	1922
Wood, G. W.,	1911
Wood, E. G.,	1917

The Nesses are sons or grandsons of the late Robert Ness, the well-known Ayrshire breeder of Howick, Que.

Many of the above graduates are filling official or teaching positions. According to the records, these are as follows:—

Robert Newton, Associate Professor of Field Husbandry, University of Alberta; William Newton, Department of Agriculture, Victoria B.C.; Margaret Newton, University of Saskatchewan; G. C. Hay, District Agriculturist, Kamloops, B.C.; A. L. Hay, Agricultural Demonstrator, Cranbrook, B.C.; J. E. McOuat, Lecturer in Nature Study and Elementary Agriculture Macdonald College; J. Harold McOuat, Principal, High School, New Carlisle, Que.; Victor Matthews, Assistant Superintendent, Experimental Farm, Lethbridge, Alta.; G. D. Matthews, District Agriculturist, Soldier Settlement Board, Quebec, Que.; A. R. Ness, Lecturer in Animal Husbandry, Macdonald College; W. N. Jones, Extension Assistant, University of British Columbia; A. R. Jones, District Poultry Promoter, Charlottetown, P.E.I.; R. J. M. Reid, Fruit Inspector, Dominion Fruit Branch, Quebec; C. T. Skinner, Dominion Fruit Branch, Ottawa; G. W. Wood, Professor of Animal Husbandry, Manitoba Agricultural College; E. G. Wood, Manitoba Agricultural Extension Service.

SCHOLARSHIP FOR EXTENSION SCHOOL STUDENTS IN BRITISH COLUMBIA

ABOUT a year ago an effort was made on the part of Mr. J. L. Pridham, late President of the United Farmers of British Columbia, to establish a scholarship in Agriculture in the University of British Columbia to be known as the United Farmers' Scholarship. For the past winter a scholarship of $50 was offered by Mr. Pridham, personally, in order to get the idea started. It is hoped by Mr. Pridham to establish a Trust Fund in order that the amount of the scholarship may be available every year.

At the time of this discussion, arrangements were made whereby the University through its Extension Service would offer Extension Schools of five days' duration in a number of centres in the Province where the United Farmers' organizations were interested. Boys and girls under nineteen years of age were to be permitted to compete for the scholarship offered by the parent organization.

Extension Schools were held in the following places:—Appledale, 98; Creston, 113; Rock Creek, 44; Duncan, 85; Salmon Arm, 94; Enderby, 83. In all, thirty-two boys and girls wrote the examination, the winner being Kathleen F. E. Miles, Salmon Arm, with a total of 90 marks.

The scholarship may be enjoyed either as a regular student of the University or as a Short Course student. The examination paper was as follows:—

[Candidates were required to answer questions 1, 3, 5, 7, and 9, and any three of questions 2, 4, 6, 8, and 10. Also any two of questions 11, 12, 13, 14 and 15].

1. By what methods can we increase and preserve the moisture in our soils?

2. Give a detailed description of the growing of either corn or roots.

3. Outline a suitable method of caring for and feeding a dairy calf, or a beef calf from birth to three months of age.

4. Describe the conformation of a dairy cow that you would expect to utilize her feed for profitable production. Give brief reasons why the conformation you describe is desirable.

5. Discuss the factors which influence the souring and spoiling of milk.

6. Define a 'High Grade Cream'. What precautions must be taken in order to secure such a cream and why are the precautions to be observed?

7. Describe briefly the chief factors which influence the quality of vegetables.

8. What causes may be responsible for the failure of fruit trees to produce satisfactory crops? Suggest remedies.

9. A farmer in your district has a flock of pullets that laid an average of 120 eggs in their first year. Describe an economical breeding system for this farmer to follow over a period of three years to increase the egg production of his flock.

10. (*a*) If a farmer has a flock of early, well-matured pullets bred from a good laying strain, how could he feed these pullets during the months of October, November, December, January and February to secure good egg production?

(*b*) How would you proceed to fatten fifty heavyweight cockerels for market?

SPECIAL PROBLEMS

11. Assuming that Nitrate of Soda with 15.5 per cent nitrogen, costs $60 per ton, what is the value of 1 pound of nitrogen in

(*a*) Sulphate of ammonia.
(*b*) Liquid manure.
(*c*) Raw bone meal.

12. Discuss briefly three (3) important reasons why some dairy farmers succeed while others fail.

13. (*a*) What is meant by 'Milk suitable for Cheese-making'?

(*b*) What is 'Starter'?

(*c*) Why are starters used in cheese-making?

14. Briefly indicate how the following fruits are propagated: (1) Strawberries; (2) Red Raspberries; (3) Loganberries; (4) Black Currants; (5) Gooseberries. Explain how the pruning of the black currant differs from that of the gooseberry.

15. How would you take care of three hundred baby chicks coming from an incubator at one time? Describe how to feed these chicks until they are two months old.

TEACHING MILK FACTS

SOCIETY'S need for a better understanding of the vital place that milk holds in the diet of growing children will receive the broadest recognition at the World's Dairy Congress of 1923. The United States has been making an organized effort to improve the health of its school children by a wiser use of milk and milk products. Some idea of what is being accomplished may be gained from statements made in the last report of the California Dairy Council, one of the most active state organizations engaged in this work.

A few public schools had milk served to the pupils when the Council began its work late in 1919; but the idea prevailed that the children got enough milk at home. The Council's milk survey showed that, of 130,968 children, dwelling in 8 principal cities, 54,233 received no milk at home; while 42,940 received not more than one glass (half-pint) a day. To-day, there is scarcely a city of any size in the State of California that does not have some sort of milk service in the public schools. In San Francisco, 10,500 half-pint bottles are purchased by the children at the school lunches every day. One Berkeley school had milk service in the fall of 1919. To-day, every school in Berkeley has such service.

Last year the people of the State consumed 13,500,000 gallons of milk more than in any previous year. The per capita consumption increased from 17½ gallons in 1921 to 22 gallons in 1922; while the per capita consumption of butter increased from 22 to 22½ pounds in the same period. The health of the rising generation already shows the effects of the use of this better diet.

Two distinct types of agricultural education are being assisted by the Agricultural Instruction Act: (1) Vocational and technical in nature, taught to those who intend either to become farmers or to occupy technical positions; (2) General and social in nature, considered to be indispensable in any well-rounded educational programme in a country whose basic industry is agriculture.

It is with the general type that the public schools are mostly concerned, whereas the agricultural colleges and schools supply instruction that is essentially vocational.—"*The Federal Aid to Agriculture.*"

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

THE INFLUENCE OF SOIL FERTILITY ON THE WATER REQUIREMENTS OF CROPS

The Third of a Series of Three Articles by W. H. Snelson, Senior Irrigation Specialist, Irrigation Branch, Dominion Reclamation Service

IT is a proven fact that less water is required to produce a given yield per acre on a fertile soil than on a less fertile soil; therefore, the water requirements for any specified yield per acre will vary as the soil is rich or poor in available plant food.

The food materials needed by plants are obtained from the soil solution by osmosis through the root hairs. The more concentrated or richer this solution is in the food materials being used by the plant, the less the amount of water per pound of dry matter produced that the plant will have to absorb to satisfy its requirements.

Nitrogen is one of the most important food elements used by plants and the one most likely to become exhausted from the soil. It is never very plentiful in an available form as it is very readily leached out by heavy rains or over-irrigation.

Leguminous plants, such as alfalfa, clover and peas, are able through the aid of certain bacteria that live in nodules on the plant roots, to utilize atmospheric nitrogen. Not only are the very large nitrogen requirements of the plants supplied during their period of growth, but also after the crops have been removed the decomposition of their roots in the soil leaves a large amount of nitrogenous matter—the soil thus being richer in nitrogen than it was before growing the leguminous crop.

The value of crop rotations containing legumes in decreasing the amount of water required to produce a given crop yield per acre has been demonstrated very clearly by the irrigation investigations at the Brooks experiment station, and a study of the results obtained by the experiments conducted shows that a farmer in raising the general fertility of his soil by means of these rotations, provides at the same time for an increased production per acre-foot of water applied.

Crop Grown	Yield in Bushels per Acre	Total depth of water in acre-feet per acre required to produce a given yield per acre when grown on soil of:— Excellent Fertility	Medium Fertility	Poor Fertility
Wheat	30	0·98	1·23	2·02
Oats..	80	0·98	1·14	1·50
Barley	48	1·12	1·55	2·00
Potatoes	300	1·10	1·56	.....

The preceding table is compiled from results obtained at the Brooks experiment station and gives the amount of water in acre-feet per acre required to produce given yields per acre when the crops were grown on soil of excellent, medium and poor fertility. The depths under the heading "Excellent Fertility" were required when the crops were grown upon land that had grown a leguminous crop the year previous, or that had grown one cultivated crop since being in leguminous crops for several years. The depths under "Poor Fertility" were required when the crops were grown on land that had been in grain for three or four years previous or that had grown no legume in the rotation.

It required approximately twice as much water to produce a yield of thirty bushels of wheat per acre if grown on soil of poor fertility than if grown on soil of excellent fertility.

Water Cost Reduced by Maintaining Fertility

As an illustration of how fertility reduces water cost, assume that a farmer has forty acres of wheat sown on land that has previously been in alfalfa and where the soil fertility is excellent, and that he also has another forty acres of wheat sown on land that had grown five or six successive crops of grain with no leguminous crop in the rotation and where the soil fertility is poor. To produce a yield of thirty bushels per acre will require the application of twelve acre-inches of water to the fertile field and twenty-four acre-inches of water to the poor field. Assume still further that the ditches have been laid out correctly on each field, that a head of two cubic-feet per second is used for irrigating, and that the irrigators' time is worth thirty-five cents per hour. Then, as the fertile field requires twelve acre-inches per acre and the streams being used will deliver two acre-inches per hour, it will take the irrigator six hours per acre to apply the required amount of water. As the poor field requires twice as much water as the fertile field it will take the irrigator twelve hours per acre to apply the

Oats following Clover, Brooks, Alberta, Irrigation Experiment Station

required amount of water. Therefore, the irrigation, for labour of irrigator only, is costing fourteen cents per bushel on the poor field and seven cents per bushel on the fertile field. The fertile field is, however, capable of producing a maximum yield of fifty bushels per acre with twenty-one inches of water at a cost for irrigators' wages of seven and one-half cents, while the poor field is limited to a yield of thirty bushels per acre at fourteen cents. If wheat were bringing one dollar per bushel and the cost for irrigators' wages were deducted the comparison would be:—Fertile field, 50 bu. x 92½c. (1.00—7½)=$46.25; Poor field, 30 bu. x 86c. (1.00—14)=$25.80.

Building up Soil Fertility on an Irrigated Farm

Soil fertility may be built up and maintained:—

(1) By the introduction of organic matter in the form of decaying roots from leguminous and other crops and in the form of green manure crops.

(2) By increasing the amount of available plant food in the soil through maintenance of conditions favourable to the action of nitrifying bacteria; and,

(3) Through the utilization, and addition to the soil, of the free nitrogen of the air by means of the symbiotic bacteria of leguminous plants.

By Introduction of Organic Matter by Green Manures and Crop Residues.—The most important and least appreciated method of maintaining or increasing the supply of organic matter in the soil is by the use of green manures and crop residues. A ton of clover ploughed under will add nearly three times as much organic matter to the soil as can possibly be recovered in the manure if the clover is fed to livestock. As the most important object achieved by green manuring is the addition of organic matter to the soil, it follows that, other things being equal, the best green manure crop is that which furnishes the largest amount of material which will readily decay in the soil and thus form humus. In general, alfalfa, clover, and peas have been found more valuable for green manuring than other crops because they not only provide organic matter but also leave nitrogen in the soil when they decay. Experiments at Brooks show that clover stubble of two years standing enriches the soil, when ploughed under, more than a three-year stand of grains.

By Maintenance of Conditions Favourable to Nitrification.—By far the larger part of the nitrogen of soils is stored in the form of humus, and thus, through the various processes of fermentation, is gradually made available to plants in the form of nitric acid.

The nitrogenous compounds of organic matter, when incorporated in the soil, are first converted into ammonia by certain bacteria; but no sooner is the ammonia produced than it is converted into nitrous acid by the nitrous ferment. But the process does not end here, for no sooner is the nitrous acid formed than it is converted into nitric acid by still another distinct kind of micro-organism.

In studying the conditions under which the nitric ferment works most vigorously it has been learned that the bacteria cease to develop nitric acid from humus when the temperature falls below about 41° F., that its action is only appreciable at 54° F., while it becomes most vigorous at 98° F., but at 113° F. its activity drops back again. A warm soil favours nitrification. *To keep soils warm they should be well drained and receive early and*

thorough cultivation to prevent the heat losses of evaporation.

The nitrifying bacteria, being aerobic, require free oxygen; this element is also needed to prevent the destruction of the nitrates after they have been formed. The farmer must see to it then that his soils are sufficiently aerated to ensure the production of nitrate on the one hand, and to prevent their destruction on the other.

A well aerated soil favours nitrification; *to keep soils well ventilated they should be well drained, not over-irrigated, and well tilled.*

In excessively dry soils, or those insufficiently drained, and therefore imperfectly supplied with air, nitrification is stopped. The highest fertility and consequently the highest yields are obtained where conditions favour the development of the necessary bacteria. Experiments at the Brooks experiment station show: (*a*) the highest yields occurring on those plots in which an optimum moisture content—about twenty per cent by dry weight of soil—was maintained throughout the growing season; (*b*) the lowest yields occurring on plots that were too dry, and (*c*) less than maximum yields occurring on those plots receiving excessive quantities of water.

The irrigation farmer is well equipped to maintain on his farm the conditions that favour the liberation of nitrogen from the organic matter of the soil and its conversion into available nitrates. By growing deep rooted crops and cultivated crops in some well-planned rotation, he may improve the general tilth and aeration of the soil. By economical and timely irrigation he can maintain the moisture content of the soil at that percentage most favourable to nitrification.

Utilization of Atmospheric Nitrogen by Legumes. - - Leguminous plants, such as alfalfa, clover and peas, are able, through the aid of certain bacteria that live in nodules on the plant roots, to utilize the atmospheric nitrogen. Not only are the very large nitrogen requirements of the plants supplied during their period of growth but also after the crops have been removed, the decomposition of their roots leaves a large amount of nitrogenous matter in the soil.

Legumes, in themselves, have no power to abstract nitrogen from the air; this was very clearly illustrated by an experiment at the Brooks station in which alfalfa was grown on two different plots, one inoculated, the other not inoculated. The alfalfa on the inoculated plot grew vigorously; that on the non-inoculated plot produced a very poor and scrawny growth.

The nitrogen-fixing bacteria, once established on the roots of a leguminous plant, cause the formation of small tubercles in which they live, drawing nourishment from the sap of the plant and in return giving to the plant compounds of nitrogen which they are able to produce from the free nitrogen of the soil air.

The following table shows the 1922 yield of grain and cultivated crops following legumes and grasses in five crop rotations in use at the Dominion experiment station at Brooks, Alberta.

Chart Showing Yields Per Acre of Grain and Cultivated Crops Following Leguminous Crops at Dominion Irrigation Experiment Station, Brooks, Alberta, 1922

A	Alfalfa (Seeded)	Alfalfa	Alfalfa	4849 Alfalfa	4547 Alfalfa 4 to 6 tons per acre	5756 Potatoes 406 bush.	5554 Wheat 65 bush.	5352 Flax 30 bush.
B	6766 Alsike Clover (Seeded)	6564 Alsike Clover	6362 Alsike Clover 2 tons hay	6160 Alsike Clover 3 bush seed per acre	5958 Corn 17 tons per acre. Greenweight	7372 Oats 134 bush	7170 Wheat 58 bush.	6968 Oats 109 bush
C	Grass (Seeded)	Grass	Grass 1·5 tons hay	Potatoes 26? bush.	Barley 50 bush.	Wheat 42 bush.		
D	Red Clover (Seeded)	Red Clover 5 bush. seed or 2 tons hay	Oats 120 bush.	Barley 63 bush.				
E	Peas 57 bush.	Wheat 56 bush	Oats 100 bush.	Barley 44 bush.				

Wheat Yields

The maximum yield of wheat, sixty-five bushels per acre, was obtained in rotation "A" where the soil fertility was very high due to the three-year stand of alfalfa preceding the potato crop. The next highest yield, fifty-eight bushels per acre, was obtained in rotation "B" where the fertility received by the soil from a two-years growth of alsike clover had been depleted to some extent by the production of one crop of corn and one crop of oats before the wheat crop. The next highest yield, fifty-six bushels per acre, was obtained in rotation "E" where the wheat crop followed one crop of peas. The lowest yield of wheat, forty-two bushels per acre, was obtained in rotation "C" where the crop followed two years in grass, one in potatoes and one in barley.

The wheat in rotation "E" occupied the same land in 1922 that it did in 1918 when the land was broken from sod. The maximum yield per acre from this rotation was forty-one bushels in 1918 and fifty-six bushels in 1922, showing that by growing peas one year in four the soil fertility has not only been maintained but increased.

Oat Yields

The maximum yield of oats, 134 bushels per acre, was produced in rotation "B" where the crop had the advantage of the fertility built into the soil by three years of alsike clover—the last year of which was as green manure—and further elaborated by the cultivation treatment applied to the immediately preceding corn crop.

In rotation "E" 100 bushels of oats were produced per acre as a result of the fertility furnished by the crop of peas two years previous.

Barley Yields

The maximum yield of barley, sixty-three bushels per acre, was produced in rotation "D" where the land had grown a crop of oats since being in red clover for two seasons. The barley for rotation "C" occupied the same position in relation to the basic soil building crop of the rotation as it did in rotation "D," but yielded only fifty bushels per acre. The grass, not being a legume, did not leave the soil as fertile as the clover. The barley in rotation "E" occupied land two crops removed from a legume of one year's duration only and yielded but forty-four bushels per acre.

Potato Yields

Potatoes following a two-year stand of alfalfa yielded 406 bushels per acre as compared with potatoes which followed a two-year stand of grass and yielded but 263 bushels per acre. This is a striking illustration of the soil fertility building value of a leguminous crop when compared with that of a non-leguminous crop.

Economic Value of Legumes

There is ample evidence in the foregoing data to show the value of legumes in maintaining soil fertility and making possible the continuous production of large crop yields at a minimum water cost in acre-inches per pound of crop produced.

Summary

It is impossible in this series of articles to touch on all the factors which have an influence on the success or failure of irrigation farming and only those factors have been dealt with that are associated with crop production under irrigation. There still remain the problems of how best to market the commodities raised on the farm, whether to feed beef cattle or to sell the products through the dairy herd, or to market the produce direct.

It must be remembered that while all reasonable efforts should be made to produce large crops, this must be accomplished by the practice of those principles of thrift that are essential in any steady occupation. A large portion of the profits in irrigation farming lie in the side lines or by-products. Statistics show that in the production of the common field crops the farmer is making not much more than day-labourer's wages but that the larger part of the profits lie in the manufacturing of the forage and grain crops into meat, butter and eggs by means of livestock and in so arranging the farming programme that the farmer and his family can be engaged in profitable occupations during spare time intervals. Farming under irrigation will be more profitable to the man who has a small holding and can get along without outside labour, than to the farmer who has a large area and who must rely on one or more hired men to assist him.

CANADA'S RECORD AT LEADING AGRICULTURAL SHOWS IN 1922

THE high place secured by Canada's agricultural and horticultural products at shows held in Great Britain and the United States, in 1922, is indicated by the following summary:

ONTARIO

Fruit

At the Imperial Fruit Show, held in London, England, apples from Ontario secured eleven first prizes; nine second prizes and one third prize. In addition to this, a splendid display of commercial apples and pears was made. Seventy cases of choice pears and apples, and six hundred baskets of "Wealthy" apples, the only dessert apples ready at that time, made a most imposing exhibit and attracted a great deal of attention.

Horses, Cattle, Sheep

At the exhibit of Ontario dairy cattle at the National Dairy Show held at St. Paul, Minn., Ontario cattle won two championships, two 1st prizes, three 2nd prizes, and five 3rd prizes, besides securing several other awards in "string" classes. In the

Dairy Herd Class, Ontario stood second in the exhibits.

At Chicago, where the International Live Stock Show has become the greatest world's show of its kind, Ontario achieved great distinction in Clydesdale horses, carrying off the Reserve Championship, two 1st prizes, three 2nd prizes and several 3rd and 4th prizes, all classes being very strongly contested.

The outstanding achievement was the awarding of the champion carlot at the show to Ontario, and the carrying off by an Ontario breeder of the grand championship wether under two years, and the grand championship of the show by the same exhibitor. This was the first time in the history of the show that the top prizes were all won by one man.

The province was represented in the following classes: Southdowns, Oxfords, Lincolns, Leicesters and Shropshires, and the exhibits won in all classes eight championships, thirty-two first prizes, twenty-five second prizes, and several third prizes.

In the Shorthorn and Angus classes of general cattle, Ontario again stood high, and the fact that Ontario breeders were chosen as judges at this show attests to the character of the stock that is being raised in this province.

Cheese and Butter

At the London show, one thing was brought out very clearly, and that was the need for establishing grades and uniformity in order to compete in the British market. For example: in butter, Australia scored 100 points against 97 for Ontario, and won first, second and third prizes in the salted, as well as the unsalted classes.

The same thing was true in cheese; South Africa wining first prize, and Ontario coming second, with another entry being highly commended.

This competition with producers from other countries opens up to our farmers a vision of what world trade means, and what must be done in order to compete.

SASKATCHEWAN

At the International Grain and Hay Show, Chicago, Ill., 1922, Saskatchewan growers won eleven prizes for wheat out of 26, thus maintaining the province's reputation for the production of the finest hard spring wheat. Many successes were also secured in other sections. The complete list is as follows:—

Threshed wheat, Sweepstakes, 1st and 5th (Hard Red Spring); 6th, 12th, 13th, 18th, 19th, 21st, 25th (Reserve), 7th (Hard Red Winter). Threshed oats, 11th, 18th, 26th, 29th, 34th; threshed barley (two-rowed), 8th; threshed rye, 12th; threshed clover, 9th; threshed peas, 1st.

In connection with the above, it may be stated that Saskatchewan growers have won the wheat championship nine times in eleven years, not exhibiting one year and taking second the other.

ALBERTA

Once more Alberta upheld its reputation at the International Hay and Grain Show in Chicago, in 1922, when grain from this province secured no less than three grand championships, one being in oats, another in peas and another in rye. In wheat, Alberta exhibits gained 2nd, 8th, 10th and 11th places. In oats, exhibits from Alberta secured 1st and grand championship, as well as 12 other prizes from 2nd to 24th. In barley, Alberta exhibits secured 1st and 5th places. In peas, Alberta exhibits secured 1st and grand champion, also 2nd, 3rd and 4th. In rye, Alberta was given 1st and grand champion, and in alfalfa won second place.

Live Stock Winning

At the International Live Stock Show, Chicago, 1922, Alberta stock won the following places:—

Galloways, 1st and grand championship; Shorthorns, a 4th and a 7th prize; Herefords, 2nd, 9th and 11th places; Grades, 1st and 4th, and Shorthorn special.

The livestock exhibit was prepared by the University of Alberta.

The grain exhibit at Chicago was made up by exhibitors from all over the province, and was in charge of the field crops commissioner of the Department of Agriculture.

NOVA SCOTIA

The winnings of the province of Nova Scotia at the Imperial Fruit Show, 1922, were as follows:—

British Empire Section -

- Dessert apples, best 20 boxes, 1st prize.
- Culinary apples, best 20 boxes, 1st prize.

The prize consisted of a gold medal and £50 cash in each class.

In the Overseas Section, Nova Scotia took third place, being preceded by Ontario and British Columbia.

The combined winnings in the two sections were: two firsts; three seconds; five thirds, and £183 cash.

NEW BRUNSWICK

New Brunswick fruit growers did not exhibit at the Imperial Fruit Show, 1922. It might be mentioned, however, that at the show held in 1921, New Brunswick apples achieved a notable success. In that year, her exhibits of McIntosh and Fameuse —two of Canada's most famous varieties of apples—obtained first prize with gold medals and two special prizes of £5. Third prize medals were secured for Golden Russets.

BRITISH COLUMBIA

At the Imperial Fruit Show, 1922, British Columbia suffered from the fact that the Okanagan and Kootenay growers were practically unrepresented, although, in 1921, they were very successful.

A special prize of £20 was awarded to Creston for the best British Columbia exhibit in the British Empire section. The variety was Cox's Orange.

In the Overseas section, Creston and Kelowna each won a first with Cox's Orange and Spitzenberg, respectively. Creston won a third with Fameuse apples, and a first and third in "any other variety," besides a first for pears. Two special prizes in this section were awarded to Creston for the best British Columbia apple exhibit.

At the Portland, Oregon, International Live Stock Exposition of 1922, British Columbia live stock winnings were as follows:

In the classes for Clydesdale horses the winnings were, Senior and Grand Champion; Junior Champion and Reserve Grand Champion. Also seven firsts and a number of second and third prizes.

In the classes for Dorset sheep the winnings comprised two championships, and 14 first and five second prizes.

FIRST SHIPMENTS OF STORE CATTLE TO GREAT BRITAIN

THE first shipments of store cattle to Great Britain, since the removal of the embargo on April 1, 1923, arrived at Manchester and Glasgow respectively on April 5. The steamship *Manchester Division*, owned by the Manchester Liners, Limited, was the first to reach port. Her consignment consisted of 423 head of Shorthorns, Angus and Herefords, shipped by Messrs. Rogers and Maybee, of Toronto, for Mr. T. Woodward, M. T. Chapman, and Messrs. Coller and Black. Mr. A. H. Carley, Veterinary Inspector of the Health of Animals Branch of the Dominion Department of Agriculture, accompanied the shipment. His certificate of health was confirmed by the port inspectors. The price obtained ranged from £22 to £32 per head, or 9½d. to 11d. per lb. Forty animals were purchased for immediate slaughter, and the remainder were distributed.

The Glasgow shipment, via the Donaldson liner *Concordia,* was a few hours later in arriving. It consisted of 221 head, made by the Harris Abattoir Company, of Toronto, the United Grain Growers' Association and Mr. Munro, Montreal. The majority of the animals were Shorthorns but there were also some Hereford and Polled Angus crosses. A clean bill of health was given. The animals were fats rather than stores, and nearly 100 were purchased by butchers. The average price per head was £32, or 61s. per cwt., live weight. Mr. Duncan Marshall, Dominion Commissioner of Agriculture, was present on arrival of the shipment.

EXPERIMENTAL SHIPMENT OF CATTLE AND CHILLED BEEF

THE Dominion Department of Agriculture recently made an experimental shipment of cattle to Great Britain, with a view to comparing the shipment of chilled beef, store cattle and fat cattle.

For the purposes of the experiment, 180 head of steers, fed during the past winter on the Experimental Farms and Stations at Lethbridge, Indian Head, Rosthern, Brandon, Ottawa, Lennoxville and Kentville, were selected and assembled at Montreal. Fifty of these were chosen, slaughtered, and the carcases chilled and shipped to Liverpool in the refrigerator chambers of the *S.S. Coracero,* which sailed June 1. This shipment will be sold by a responsible wholesale meat firm as Canadian chilled beef.

Of the remaining 130 head, all of which were shipped alive on the *S.S. Irishman*, sailing for Liverpool May 28, eighty were to be sold as stocker cattle, twenty-five were to be slaughtered as fat cattle and sold as fresh Canadian beef, while the remaining twenty-five were to be sold either as stocker or fat cattle, according to the price to be obtained.

This shipment is in charge of Mr. Victor Matthews, Assistant to the Superintendent at Lethbridge, Alta., while the selling arrangements are in the hands of Mr. P. D. Chapman, of Fakenham, Norfolk. Mr. Duncan Marshall is supervising the selling arrangements in connection with the whole experiment, and it is hoped that some valuable data will be obtained.

CANADIAN CATTLE MARKING ORDER

THE Minister of Agriculture and Fisheries for Great Britain, by virtue and in exercise of the power conferred by section 9 of the Importation of Animals Act, 1922 (Session 2), hereby orders as follows:

Marking of Canadian Cattle

1. (1) Canadian cattle, except as hereinafter provided, shall, as a condition of landing in Great Britain, be marked before shipment by securely affixing to the right ear of each animal a tag of a pattern approved by the Minister of Agriculture and Fisheries with the letter "C" and a serial number stamped therein, and also, in the case of any cattle shipped from a port in the Dominion of Canada after the first day of September, 1923, by branding the animal on the left hindquarter with the letter "C," or tattooing that letter on the left ear, unless the animal is already branded with a brand registered by the government of a province of the Dominion of Canada: Provided that this provision shall not apply to cattle to be landed at an imported animals wharf for immediate slaughter.

(2) For the purposes of this article the expression "Canadian cattle" means cattle born and reared in the Dominion of Canada.

Short Title and Commencement

2 This order may be cited as the Canadian Cattle (Marking) Order of 1922, and shall come into operation on the date on which the Importation of Animals Act, 1922 (Session 2), comes into operation.

GIFT OF SHIRE HORSES TO CANADA

THE Minister of Agriculture, Hon. W. R. Motherwell, stated in the House of Commons recently that the five Shire horses, donated to Canada by the Shire Horse Association of Great Britain, would be located at the Dominion Experimental Station, Lacombe, Alberta. The sixth, "Snelston Topper," donated by Mrs. Stanton of Snelston Hall, Ashbourne, will be assigned to the Dominion Experimental Station at Lennoxville, Que. This disposition, the Minister stated, was in conformity with the wishes of the donors that the animals should be located in districts where some attention had already been given to the breed.

The horses reached Canada recently in charge of the Dominion Animal Husbandman, Mr. G. B. Rothwell. Those destined for Alberta will be exhibited at various western shows this summer.

With the horses came a consignment of Ayrshire cattle, a number of sheep, and a few swine, purchased for use at the Central Experimental Farm, Ottawa, and at various Stations.

DAIRYING IN AUSTRALIA AND NEW ZEALAND

THE Dominion Dairy Commissioner, Mr. J. A. Ruddick, returned at the end of April from a trip to Australia and New Zealand, where, under instructions from the Minister of Agriculture, Hon. W. R. Motherwell, he investigated dairy conditions for the information of Canadian dairymen. Mr. Ruddick was accompanied by Mr. W. A. Wilson, of Regina, Sask.

Mr. Ruddick and Mr. Wilson were cordially received in both countries by government officials, factory managers and others connected with the dairying industry, every opportunity being afforded them for gathering information. Mr. Ruddick's former connection with the dairy industry in New Zealand, as dairy commissioner from 1898 to 1900, greatly facilitated his investigations in that country. He reports, as regards New Zealand, that great progress has been made of late years in the country generally and in dairying in particular. In Australia, much advance has been made in methods and organization since the war In both countries large factories are the rule. The output of some creameries runs from 800 to 1,000 boxes of butter a day, while, in New Zealand, a cheese factory that does not make four or five hundred tons in a year would be considered small. Both countries are devoting their energies to the improvement of quality, regardless of all other considerations, and in Mr. Ruddick's opinion, Canada will meet very keen competition from these countries in the future. The information secured will be made available to dairymen in Canada as soon as practicable.

A PARASITE OF THE CORN BORER

THE United States Bureau of Entomology, through the courtesy of Dr. L. O. Howard, Chief of the Bureau. and Mr. W. R. Walton, Entomologist in charge of Cereal and Forage Insect Investigations, is furnishing the Entomological Branch of the Dominion Department of Agriculture, with a supply of the imported corn borer parasite known as *Hebrobracon brevicornis*. This parasite, which has been imported by the United States Government from Europe, has been reared in large numbers in Massachusetts and has been liberated in districts infested with the corn borer.

For the purpose of breeding and colonizing this parasite in districts in southern Ontario heavily infested with the European corn borer, the Entomological Branch is establishing a temporary laboratory at St. Thomas. It is to be hoped that the experiment will successfully establish the parasite in that province, and thus assist in the control of this important pest of corn and other crops. The St. Thomas laboratory will be in charge of Mr. A. B. Baird, who has had considerable experience in parasite work.

THE EUROPEAN CORN BORER

Quarantined Area Extended

ON February 26, 1923, an Order in Council was passed which quarantined the following territory in the Province of Ontario on account of the European Corn Borer:

The counties of Essex, Kent, Lambton, Elgin, Middlesex, Norfolk, Oxford, Haldimand, Welland, Lincoln, Wentworth, Brant, Halton, Waterloo, Perth, Huron (with the exception of Ashfield, Wawanosh East, Wawanosh West and Howick townships), Peel (with the exception of Caledon township); as well as, Culross township in Bruce county; Guelph in Wellington county; Etobicoke, Scarboro and York in York county; Pickering, Whitby East and Whitby West in Ontario county; Darlington and Clarke in Durham county and Brighton township in Northumberland county. On account of the severity of the infestation in Elgin and Middlesex counties they have been placed under double quarantine.

The products affected by the regulations are corn fodder, corn stalks, including broom corn whether used for packing or other purposes, green sweet corn, roasting ears, corn on the cob or corn cobs. The movement of these products from the quarantined area to points outside is prohibited.

The cities of Toronto and Hamilton are now included in the quarantined territory, consequently the markets in these cities will be open to all growers of sweet corn with the exception of those situated in the counties of Elgin and Middlesex. It is pointed out however, that quarantined products must not be shipped from Toronto or Hamilton to any point outside the quarantined territory.

United States Quarantine No. 41 prohibiting the importation, without inspection, of various cutflowers and vegetables from Ontario on account of the European Corn Borer, is still in force. The Dominion Department of Agriculture will co-operate with growers again this season in making all reasonable inspections and furnishing the necessary certificates for proposed shipments.

INSECT PESTS OF CANADA AND THE UNITED STATES

AS a result of an international conference on insects of importance both to the Northwestern States and the prairie Provinces of Canada, recently held at Winnipeg, Manitoba, plans were perfected for conducting experimental work in the control of these insects. The experiments are to be carried on in such a way as to render the results comparable in all the districts involved. For the purpose of plotting the occurrence of the principal insect pests of common importance to Canada and the United States, a base map of all the international territory affected has been prepared.

The principal pests discussed at the Conference were grasshoppers, the western wheat-stem sawfly, the pale western cutworm, and the Hessian fly. The Bureau of Entomology of the United States Department of Agriculture was represented at the conference, as well as the Dominion Entomological Branch.

IMPERIAL FRUIT SHOW, 1923

THE Imperial Fruit Show, 1923, will be held in Bellevue Gardens, Manchester, England, from October 26 to November 3, inclusive.

The previous two shows were financed by the London Daily Mail, but arrangements have now been made for the complete financing and direction of the Show by a committee representing the fruit industry in Great Britain. The regulations in connection with the Show have been modified to some extent, and practically all of the changes are of advantage to Canadian exhibitors.

INTERNATIONAL CONGRESS OF REFRIGERATION

AT the Third International Congress of Refrigeration, held in Chicago in 1913, the year 1916 was fixed for the holding of the Fourth Congress and St. Petersburg designated as the place of meeting. The War intervened and, with the resumption of peace, plans were made to hold the Congress in London in June, 1924.

The British Government is officially subscribing to the international movement, and will be the official host at the next Congress. It is expected that representatives of forty countries will be present.

INTERNATIONAL FARM CONGRESS

THE Seventeenth Annual Convention of the International Farm Congress will be held at Kansas City, Missouri, October 10, 11 and 12, 1923.

The convention will devote its attention to the economic problems of agriculture, but the programme will include the discussion of the best farming practices, agricultural education, reclamation, dry-farming, natural resources, transportation, and highways.

International factors bearing upon the agricultural industry will be considered, and for this reason it is expected that those countries having trade relations in farm products with America will send representatives.

WORLD'S DAIRY CONGRESS

IN order to fully present the milk industry of the United States, the World's Dairy Congress will be held in three cities. It will open at Washington, D.C., on October 2 There the delegates will be officially welcomed and will have an opportunity to inspect the Government's laboratories, experiment stations and statistical and economic bureaus. The sessions held there on October 2 and 3 will consider questions of the broadest import.

The work of the National Dairy Council in promoting national health by educating the public as to the food value of milk and its products will be demonstrated for the delegates at Philadelphia, Pa., on October 4, under the auspices of the National and Inter-State Dairy Councils.

From October 5 to 10, the Congress will meet at Syracuse, N.Y., in co-operation with the seventeenth National Dairy Exposition. Mornings will be devoted to Congress sessions; afternoons to the inspection of Exposition displays and evenings to group meetings. The Exposition annually presents a cross-section of the milk industries of the United States and Canada, with displays of the best bred dairy cattle, the newest machinery and equipment and the latest methods of production, manufacture, distribution and use of dairy products, as well as public health activities of the Government and private organizations.

An international banquet will be held on the evening of October 10. When the Exposition closes on October 13, the delegates will be given an opportunity to take part in sight-seeing excursions.

WINNERS OF SPECIAL PRIZES AT MACDONALD COLLEGE

THE challenge cup given by Sir Edward D. Stern to the Macdonald College student (Faculty of Agriculture, McGill University) taking the highest marks in live stock judging in the fourth year, *i.e.*, judging all classes of live stock in the final examinations, was this year won by Edgar Wendell Holden, of Frelighsburg, Que.

The prize offered by the Minister of Agriculture for the Province of Quebec to the fourth-year student standing highest in the horticultural option was awarded to Wilfrid Henri Perron, of St. Philippe de Chester, Que.

A special prize, given by three members of the staff, for the student taking the highest standing in plant pathology, was won by Thomas Clifford Vanterpool, of St. Michael, Barbados, B.W.I.

NEWS ITEMS AND NOTES

In a recent address, the Deputy Minister of Agriculture, Dr. Grisdale, drew attention to the notable strides in dairying made in the Prairie Provinces, where only a few years ago cereals, and to some extent live stock, were the only products of consequence. On the British market, the only Canadian butter that is in demand, he said, comes from the Prairie Provinces. He spoke of the change that has taken place in the attitude towards the cream-gathering creamery. Not many years ago it was condemned as a wrong method. To-day all of the fine butter made in Saskatchewan and Alberta is produced from gathered cream. The success of this system is in a large measure due to the cream grading policy of these provinces and the thorough system of pasteurization employed.

At 11 exhibitions across Canada at which Alberta creamery butter was exhibited during 1922, a total of 229 prizes were won by that Province out of 436 prizes awarded. Of these there were 54 first prizes out of 100 awarded, 74 seconds out of 123 awarded, 83 thirds out of 157 awarded, 8 fourths out of 17 awarded, 5 fifths out of 17 awarded, 2 sixths out of 7 awarded, 2 sevenths out of 7 awarded, 1 eighth out of 4 awarded. In total number of points won during the year, Alberta stood first among seven of the provinces, having taken 1,526 points out of a total of 2,808.

Every confidence is felt by the Ottawa authorities that the new grading regulations for export butter and cheese adopted by the Dominion, which came into force on April 1, will have a marked beneficial effect on Canada's export trade in dairy products.

Government grading of cream as received at the creamery was put into effect on May

1 in the provinces of Manitoba, Saskatchewan and Alberta. The adoption of compulsory cream grade standards is in response to the urgent request of creamerymen and producers.

The grades are: "Table Cream," "Special Grade," "First Grade," "Second Grade," "Off Grade." A premium of not less than two cents per pound butter-fat is to be paid for Table and Special cream over first grade, and a premium of not less than three cents per pound butter-fat for first grade over second grade.

The official graders, in addition to grading the cream, also check the weights and butter-fat tests of the farmers' shipments. The cost of the service is borne by the creameries.

"Large factories attract a superior class of men to the ranks of the cheese makers," states the Dominion Dairy Commissioner, Mr. J. A. Ruddick. "The overhead costs decrease rapidly as output increases, and the larger the output the easier it is to provide capable management. It is right at this point of management that so many of our factories fail. I do not know of any other industry of equal importance and extent in which there is so little management. The small factory cannot afford to pay for it.

"Importers in the United Kingdom make a strong point of the advantage of having such large quantities of cheese of uniform character and quality under a single factory brand. Since the New Zealand cheese has begun to loom so large in the market, shipments of cheese from Canada, consisting frequently of ten or a dozen factory marks in a lot of 500, have been more criticized on this score."

"I firmly believe," states Mr. Ruddick, "that grading will help very materially to remove many of the defects in the quality of both cheese and butter. It has been demonstrated wherever it has been applied, not only to dairy produce but to other commodities, that it is a stronger influence in that direction than all other agencies put together."

Many prairie farmers this year are trying plots of corn for the first time, and much interest is being shown in this crop.

The new dairy building provided by the Province of Ontario at the Agricultural College, Guelph, is being fully equipped for experimental work. Not only will scientific investigation be undertaken in connection with cheese and butter making, but attention will be given to powdered milk and ice-cream production, as these industries are growing in importance and proving remunerative to Ontario dairymen.

Canadian agriculture is stated by Dr. Grisdale to have a valuable asset in the quality of its farm seeds. Potato seed from the Maritime Provinces has won for itself a very enviable reputation in the United States, which produces early potatoes. Prince Edward Island seed is especially favoured in this regard. In 1919 small shipments were made to some of the eastern states and did so well that the demand increased by leaps and bounds until, last year, Prince Edward Island alone sent one hundred cars of potato seed over the border. New Brunswick and Nova Scotia also marketed large quantities in the States of New Jersey, Maryland, Georgia, the Carolinas, and Rhode Island. In grains our Northern grown Marquis wheat and Prince Edward Island oats are very highly regarded in other countries for seeding purposes. Whereas a few years ago much of the United States seeding supplies of timothy, alfalfa and other varieties of clover came principally from Europe, Canada, by reason of the quality of her seed and of the satisfactory seed laws, is finding an excellent outlet in the American Republic.

A recent development in connection with Canada's export seed trade is the shipment to Argentina of 500 bushels of Registered Marquis Wheat. This wheat was the product of Saskatchewan members of the Canadian Seed Growers' Association, and the shipment was the first of its kind to go to South America in commercial quantity. The results will be observed by the representatives of the Commercial Intelligence Service of the Department of Trade and Commerce, and should the performance of the seed prove to be satisfactory, extended purchases from Canada may be looked for.

As a result of the campaign instituted by the British Columbia Fruit Growers' Association, a co-operative selling agency has been formed to control the output of the principal tree-fruit districts of the Province. The central selling agency is known as the "Co-operative Growers of British Columbia, Limited."

Two items of interest appear in the estimates of the Ontario Department of Agriculture. One is an appropriation for a radio broadcasting station at the Ontario Agricultural College. The Minister, Hon. Mr. Doherty, explained that the installation would not be proceeded with until a sufficient number of farmers were equipped to receive broadcasted information on farm topics.

The second, is an appropriation of $20,000 for the erection of a model centralized cheese factory to demonstrate the benefits to be derived from factory consolidation.

The Ontario Live Stock Improvement Train is reported to have had an attendance of about 700 at each stop. Some 30 bulls and 120 hogs were sold for breeding purposes.

The Ontario Department of Agriculture is providing a motor truck to tour certain rural districts and demonstrate water supply systems, plumbing equipment, and installation methods. The exhibits include an air pressure water system and kitchen and bathroom fixtures for the farm dwelling. One day is spent in each locality visited, lectures and demonstrations being given in the afternoon.

Last year 2,590 birds were entered in the Laying Contests conducted by the Dominion Experimental Farms. The total production was 391,805 eggs, an average of 151 eggs per bird. These eggs were produced under every conceivable weather condition, and laid by a great variety of breeds.

These contests were conducted in every province in the Dominion. In average production British Columbia led with 181·2 eggs per bird; Ontario was second with 173·5 eggs, and at the Canadian Contest, conducted at Ottawa, third with 167·1 eggs. In the British Columbia contest there were 290 birds, in the Ontario 280, and in the Canadian 600.

Registration of hens producing 200 eggs and over in 52 weeks, can be secured only through the laying contests, of which particulars are obtainable from the Dominion Poultry Husbandman, Ottawa, or the Superintendents of the Experimental Farms at Agassiz, B.C.; Lethbridge, Alta.; Indian Head, Sask.; Brandon, Man.; Lennoxville, and St. Anne-de-la-Pocatiere, Que.; Fredericton. N.B.; Nappan, N.S.; and Charlottetown, P.E.I. The registration of poultry is conducted by the Canadian National Live Stock Records, through the Canadian National Poultry Record Association.

The College of Agriculture of the University of British Columbia received accurate reports from 536 farms in connection with its Farm Survey Work in 1922. In all, 1,017 farms were visited. A number of farmers who did not keep records last year are expected to do so this year, and at a later date, a report will be published.

The report on the Poultry Farm Survey, made in 1921, has already been issued. The cost of these surveys is met from the Agricultural Instruction grant.

Since the war there has been a rapid development in poultry farming in certain districts of British Columbia. Many returned soldiers have taken up poultry farming under the Soldier Settlement Board. Moreover, many of the older established poultrymen have materially increased their flocks, and a considerable number of other settlers have gone into poultry farming in a specialized way.

The Twelfth International Egg-Laying Contest is now being held under the auspices of the Poultry Division, Provincial Department of Agriculture, at the Exhibition Grounds, Victoria, B.C., and is to continue from October 2, 1922, to October 1, 1923.

The degree of Bachelor of Veterinary Science was conferred on May 1, 1923, at a special Convention of the University of Toronto, on thirty-three graduates of the Ontario Veterinary College. Eleven were from Ontario, two from Quebec, two from Nova Scotia, five from Manitoba, two from Saskatchewan, one from British Columbia; seven were resident in the United States, while Newfoundland, Dominica, B.W.I., and Bermuda was each represented by one.

By means of the Federal grant for Agricultural Instruction, the provinces have improved their extension services, developed agricultural education, erected institutions that are doing good work, and have increased the facilities for research. The activities thus promoted include those that get closest to the people on the farm, and are therefore of greatest benefit to the rank and file of the producers.

Short courses in agriculture for men and in domestic science for women have been an important feature of extension work assisted by the Agricultural Instruction grant. Held either under local auspices or offered by the schools and colleges of agriculture, their aim has been to give instruction on improved methods and practices. Every branch of farming has been dealt with, from stock-judging to motor mechanics for men and from general housekeeping to the domestic arts for women, often accompanied by demonstration.

In the province of Nova Scotia and the other Eastern Provinces almost half of the cost of educational and demonstrational work in agriculture has been provided out of the Federal grant.

A competition has been instituted among the boys on the farms of Carleton and Russell counties, Ontario, under the R. B. Whyte Bequest, for the purpose of promoting a better understanding of the suitability of varieties for the district and the more general planting of apple tree on the farms.

The competition is open to boys under eighteen years of age living on farms in the two counties named. Each boy entering the contest will receive six apple trees of early summer or late winter varieties. The contest will extend over three years, and prizes will be awarded annually as well as at its conclusion.

In the 1923 graduating class in Agriculture at Macdonald College, the name appears of John Hume Grisdale, with first class honours in Animal Husbandry. Mr. Grisdale, who is now in his twenty-first year, is a son of Dr. J. H. Grisdale, Deputy Minister of Agriculture.

APPOINTMENTS AND STAFF CHANGES

Mr. R. H. Helmer, Superintendent of the Dominion Experimental Station, Summerland, B.C., has resigned his position to take effect at the end of August. It is understood that Mr. Helmer will direct farming operations on the large holdings in the Nicola district, acquired by Major Goldman, ex-member of the Imperial parliament.

The United States Department of Agriculture announces the appointment of M. A. Jull, B.S.A., M.Sc., Ph.D., as Senior Poultryman in charge of Investigations on the staff of the Division of Animal Husbandry of the Bureau of Animal Industry. Mr. Jull is a graduate of the Ontario Agricultural College, whence he went to the West Virginia Experimental Station, thence served with the British Columbia Department of Agriculture and then at Macdonald College, where he has been head of the Poultry Department for the past eleven years. While at Macdonald he was also engaged by the Vermont College of Agriculture in teaching and extension work. He obtained his M.Sc. from McGill University and his Ph.D. from the University of Wisconsin. His work at Washington will consist almost entirely of investigations relative to fundamental problems of the poultry industry.

ASSOCIATIONS AND SOCIETIES

Union of Quebec Co-operative Societies

An important amalgamation of co-operative societies for the disposal of farm products and the purchase of supplies has recently been effected in the province of Quebec. Under the provisions of an Act passed by the Legislature in 1922, three societies, the Farmers' Central Co-operative, the Comptoir Co-operatif of Montreal, and the Co-operative Society of Seed Producers, Ste-Rosalie, have been united in one association, known as the Co-operative Fédérée de Quebec.

The following are the officers:—

Bureau of Direction.—President, Arsène Denis, Joliette; Vice-President, R. B. Décary, Dorval; Secretary, Jos. N. Bernier, St. Jean Port-Joli.

Business Executive.—President, J. Arthur Paquet; Secretary, Ph. Gingras.

Branches, etc., are located at Ste-Rosalie Junction; Trois-Rivieres; Quebec; Princeville (abattoirs); 1461 rue Papineau, Montreal (dairy produce); Export Warehouse, 63 rue William, Montreal.

The following are the principal products and supplies dealt in:—Butter, cheese, eggs, honey, maple sugar and syrup, seed grain and grass seeds, live stock and meat products, flour and feed, fertilizers, coal, fencing, motor car supplies, galvanized sheet iron, roofing and building paper.

The business address of the association is 114 St. Paul St. East, Montreal, P.Q.

Canadian Silver Fox Breeders' Association.—At the annual meeting held at Summerside, P.E.I., on March 6, a number of changes were made in the rules with a view to a higher standard for fox registration. It was decided that the premises of breeders of registered stock should be subject to a yearly inspection by the Live Stock Branch in-

spector; the inspection to have relation to sanitation, the keeping of records, and the re-inspection of all registered animals. Animals that on re-inspection do not conform to the standard are to be eliminated.

Alberta Swine Breeders' Association. - President, W. J. Hoover, Bittern Lake; Secretary-Treasurer, W. J. Stark, Edmonton.

Royal Agricultural Winter Fair -President W. E. Dryden, Brooklin, Ont.; Vice-President, E. M. Carroll, Toronto; Secretary, A. P. Westervelt, 146 King St. West, Toronto.

New Brunswick Fruit Growers' Association. —President, W. B. Gilman, Fredericton; Vice-President, A. R. Gorham, Grey's Mills; Secretary-Treasurer, A. G. Turney, Fredericton.

Canadian Co-operative Wool Growers Limited.—President, Lieut.-Col. Robt. McEwen, London, Ont.; 1st Vice-President, J. W. Renton, Calgary; Secretary, G. O'Neil, 128 Simcoe St., Toronto.

Manitoba Poultry Breeders' Association.—President, Prof. M. C. Herner, Manitoba Agricultural College, Winnipeg; Secretary, W. J. Currie, Brandon.

Canadian Council of Agriculture.—President, W. A. Amos, Palmerston, Ont.; Vice-President, C. H. Burnell, Oakville, Man.; Secretary, J. W. Ward, 404 Bank of Hamilton Bldg., Winnipeg, Man.

Canadian Goat Society. —President, W. H. Cottrell, Vancouver, B.C.; Vice-President, C. E. Dickerman, McKay; Secretary-Treasurer, Geo. Pilmer, Department of Agriculture, Victoria, B.C.

Western Stock Growers' Association. —President, D. E. Riley, High River, Alta.; Secretary, Miss Ruth Rogers, Calgary, Alta.

Western Canada Live Stock Union.—President, G. H. Hutton, B.S.A., Calgary, Alta.; Secretary-Treasurer, E. L. Richardson, Victoria Park, Calgary; Provincial Vice-Presidents: Geo. Gordon, Oak Lake, Man.; F. H. Auld, Regina, Sask.; G. F. Herbert, Medicine Hat, Alta.; W. T. McDonald, Victoria, B.C.

United Farm Women of Manitoba.—President, Mrs. Jas. Elliott, Cardale; Vice-President, Mrs. S. E. Gee, Virden; Secretary, Miss Mabel E. Finch, 306 Bank of Hamilton Bldg., Winnipeg.

Ontario Honey Producers' Co-operative Ltd. President, W. Krouse, Guelph; Vice-President, Wm. A. Weir, Toronto; Secretary-Treasurer, Prof. F. E. Millen, O.A.C., Guelph (pro. tem.)

Alberta Cattle Breeders' Association.—President, J. G. Clark, Clark Manor; 1st Vice-President, W. H. Wallace, Viking; Secretary-Treasurer, W. J. Stark, Edmonton.

Alberta Sheep Breeders' Association.—President, Geo. Ball, West Salisbury; 1st Vice-President, W. J. Hoover, Bittern Lake. Secretary-Treasurer, W. J. Stark, Edmonton

Associate Growers of British Columbia; Ltd. --President, A. T. Howe, Vernon, General Manager, A. N. Pratt; Sales Manager, B. McDonald; Secretary, K. E. Kinnaird.

The address of the Association is Vernon, B.C.

Berry Growers' Co-operative Union of B.C. -President, J. B. Miller, Mission; Manager, A. Dobberer, Salmon Arm.

Canadian Society of Technical Agriculturists.—Officers for 1923-24: President, H. Barton, Macdonald College, Que.; Vice-Presidents, E. A. Howes, University of Alberta, Edmonton; Jules Simard, Dominion Seed Branch, Quebec; Honorary-Secretary, L. H. Newman, Dominion Cerealist, Ottawa; General Secretary, Fred H. Grindley, Box 625, Ottawa.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Experimental Station, Lennoxville, Que., 1922.—Report of the Superintendent, J. A. McClary. Dominion Experimental Farms.

Experimental Station, Lethbridge, Alta., 1922.—Report of the Superintendent, W. H. Fairfield, M.S. Dominion Experimental Farms.

Root Maggots and Their Control.—By R. C. Treherne, Chief, Division of Field Crop and Garden Insects, Entomological Branch.—Pamphlet No. 32.—New Series.

Annual Review of the Live Stock Market and Meat Trade Situation, 1922.—Comments on supply and demand. Comparative statistical tables. By P. E. Light, B.S.A., and D. M. Johnson, B.S.A., Markets Intelligence

and Stock Yards Service Division, Live Stock Branch.—Pamphlet No. 34.—New Series.

ONTARIO

Agricultural and Experimental Union, 1922.—Forty-fourth Annual Report.

Sweet Clover.—Bulletin 296. Ontario Agricultural College.

Grafting Fruit Trees.—By Jas. A. Neilson, B.S.A., M.S. Bulletin 294. Ontario Agricultural College.

Agricultural Societies, 1922.—Appendix to Annual Report. Results of competitions in standing field crops and prize-winning grain at winter fairs. The Canadian National and Central Canada Exhibitions.

BRITISH COLUMBIA

Care of Milk and Cream.—Dairy Circular No. 6. Department of Agriculture.

Bee Culture in British Columbia.—Bulletin No. 92. By W. J. Sheppard, Provincial Apiarist; A. W. Finlay and J. F. Roberts, Assistants. Department of Agriculture.

The Okanagan Valley.—Agricultural Department Circular No. 40. By William J. Bonavia, Secretary, Agricultural Department.

Poultry Farm Survey, 1921.—A Report on Sixty-five Commercial Poultry Farms in the Lower Fraser Valley and Vancouver Island. Issued by the Department of Poultry Husbandry, College of Agriculture, University of British Columbia, Vancouver. Agricultural Department Circular No. 41.

NOVA SCOTIA

The European Apple Sucker.—Bulletin No. 10. By W. H. Brittain, Provincial Entomologist.

Annual Report of the Secretary for Agriculture, 1922.

MISCELLANEOUS

Western Canada Live Stock Union, 1922.—Proceedings of the Tenth Annual Convention.

The Trench Silo.—By G. H. Hutton, Superintendent of Agriculture and Animal Industry. Canadian Pacific Railway Company. Department of Natural Resources.

Sanitation.—Sewage treatment for isolated houses and small institutions where municipal sewage system is not available. By B. Evan Parry, M.R.A.I.C., Supervising Architect. Publication No. 1. Issued by the Department of Health, Ottawa.

Report on the Grain Trade of Canada.—For the Crop Year ended August 31 and to the close of Navigation, 1922. Issued by the Dominion Bureau of Statistics, Internal Trade Branch, Ottawa.

Holstein-Friesian Herd Book. Volume XXVI. Containing a record of all Holstein-Friesian cattle approved and admitted for registry since the publication of the twenty-fifth volume of this book, under the by-laws and regulations of the Holstein Friesian Association of Canada. W. A. Clemons, Secretary and Editor.

Canadian National Record for Sheep.—Volume II. Compiled and edited in the office of the Canadian National Live Stock Records, Ottawa, and published by the Canadian Sheep Breeders' Association, 1922.

The Clydesdale Stud Book of Canada.—Volume XXX. Compiled and edited in the office of the Canadian National Live Stock Records, Ottawa, and published by the Clydesdale Horse Association of Canada, 1922.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

Supplying Britain's meat, by G. E. Putnam. London, Harrap, 1923. 169 p. il.

The potato: its culture, uses, history and classification, by William Stuart. Montreal, J. B. Lippincott co., 1923. 518 P. il.

The story of the maize plant. by P. Weatherwax. Chicago, University of Chicago press, 1923. 247 p. il.

Les bles cultives. Paris, Denaiffe & Colle. 151 p. il.

Plantes nuisibles a l'agriculture, par G. Fron. Paris, Librairie J. B. Bailliere et fils, 1917. 346 p. il.

Social and economic conditions in the Dominion of Canada. Philadelphia, American academy of political and social science, 1923. 367 p.

Marketing live stock, by H. W. Vaughan. Chicago, American institute of agriculture, 1922. 36 p.

Marketing grain, by W. J. Spillman. Chicago, American institute of agriculture, 1922. 60 p. il.

Marketing dairy products, by C. W. Larson. Chicago, American institute of agriculture, 1922. 36 p.

How the city consumer influences marketing, by C. S. Duncan. Chicago, American institute of agriculture, 1922. 12 p.

Why we have a marketing problem, by Sydney Anderson. Chicago, American institute of agriculture, 1922. 16 p.

Costs and income in land utilization, by R. T. Ely. Ann Arbor, Mich., Edwards bros., 1922. 163 p.

Characteristics and classification of land, by R. T. Ely. Ann Arbor, Edwards bros., 1922. 150 p.

Land policies, by R. T. Ely. Ann Arbor, Mich. Edwards bros., 1922. 172 p.

Effects of the war upon French economic life, ed. by Charles Gide. Oxford University press, 1923. 197 p.

Die deutsche volkswirtschaft in produktion und verbrauch, by Dr. K. Leibig. Washington, Carnegie endowment for international peace, 1922. 230 p.

Ireland. Commission of inquiry into the resources and industries of Ireland. Minutes of evidence. Dublin, 1920. 2 parts.

Economic conditions of agriculture at home and abroad, by Dr. A. G. Ruston. (Journal of the farmers' club, April, 1923).

Enseignement agricole; lois, decrets, arrêtes, circulaires et instructions. Paris, Imprimerie nationale, 1921. 246 p.

Comparison of tariff acts. Washington, 1922. 379 p.

Graphic methods for presenting facts, by W. C. Brinton. New York, The engineering magazine co. 1914. 371 p. il.

The productivity of hill farming, by J. P. Howell. Toronto, Oxford University press, 1922. 25 p.

Agriculture and the guild system, by M. Fordham. London, P. S. King & son, ltd. 1923. 24 p.

Chicago wheat prices for eighty-one years; daily, monthly and yearly fluctuations and their causes, by J. E. Boyle. Ithaca, Cornell University, 1922. 71 p.

The value of economic study in agricultural education and farm management, by A. W. Ashby. Aberystwyth, Eng. Agricultural society of the University College of Wales. 12 p.

Food production in war, by T. H. Middleton. Oxford, Clarendon press, 1923. 383 p.

The federal farm loan act, 1923. Washington, 1923. 32 p.

Social aspects of the food surplus in the United States, by B. Ostrolenk, Menasha, Wis. 1922. 92 p.

The country newspaper, by M. Van Marter Atwood. Chicago, A. C. McClurg & co. 1923. 137 p.

The county agent and the farm bureau, by M. C. Burritt. New York, Harcourt, Brace & co. 1922. 269 p. il.

Hardy border flowers, by H. H. Thomas. Toronto, Cassell, n.d. 144 p. il.

Engineering on the farm; a treatise on the application of engineering principles to agriculture, by J. T. Stewart. New York, Rand, McNally & co. 1923. 538 p. il.

Farm science; a foundation textbook on agriculture, by W. J. Spillman. New York World book co. 1919. 344 p. il.

Lindlahr vegetarian cook book and A.B.C. of natural dietetics, by Mrs. Anna Lindlahr and

Henry Lindlahr. Chicago, Lindlahr pub. co. 1922. 535 p.

The fern lover's companion; a guide for the Northeastern States and Canada, by G. H. Tilton. Boston, Little, Brown & co. 1923. 240 p. il.

The new air world; the science of meteorology simplified, by W. L. Moore. Boston, Little Brown & co. 1922. 326 p. il.

Railroad freight transportation, by L. F. Lorree. New York, D. Appleton & co. 1922 771 p.

The early herdsmen, by K. E. Dopp. New York, Rand McNally & co. 1923. 231 p.

A handbook of the community church movement in the U.S.A., by D. R. Piper. Excelsior Springs, Mo. The community churchman co. 83 p.

A laboratory handbook of bio-chemistry, by P. C. Raiment and G. L. Peskett. London, Edward Arnnold & co. 1922. 102 p. il.

Building a community, by S. Z. Batten. Philadelphia, The Judson press, 1922. 167 p.

Bibliography of the woods of the world with emphasis on tropical woods, by S. J. Record. New Haven, Yale university, 1923. 40 p. mimeo.

Hogs, by A. J. Lovejoy *with supplementary chapters on feeding*, by J. M. Evvard. Chicago, Frost pub. co. 1919. 212 p. il.

The calf club manual. Brattleboro, Vermont, The Holstein-Friesian Association of America, 1922. unpaged.

Conference on scientific and industrial research; arranged by the Canadian manufacturers' association, Ottawa, Feb. 20, 21 and 22, 1923. Toronto, The Canadian manufacturers' association, 1923. 166 p.

The letters of Agricola on the principles of vegetation and tillage, by John Young. Halifax, King's Printer, 1922. 368 p.

Poultry keeping on the farm, by Edward Brown. London, Benn bros. 1923. 54 p.

Animal nutrition, by E. T. Halnan. London, Benn bros. 1923. 52 p.

Insect pests and fungous diseases of farm crops, by A. Roebuck. London, Benn bros. 1923. 55 p.

Farm costing and accounts, by C. S. Orwin. London, Benn bros. 1923. 31 p.

The fishes of Illinois, by S A. Forbes and R. E. Richardson. Springfield, State printer, 1920 357 p. il.

Ancient man; the beginning of civilizations, by H. W. Van Loon. New York, Boni and Liveright, inc. 1922. 208 p. il.

The ornithology of Illinois. Springfield, State printer, 2 vols. 1889.

Report to the Board of agriculture for Scotland on the financial results on 65 farms for the period 1919 to 1921 and on the cost of production of 1920 crops and of milk. Edinburgh, Board of agriculture for Scotland, 1922. 30 p.

The settlement horizon, by R. A. Woods. New York, Russell Sage Foundation, 1922. 499 p.

Elements d'economie rurale non-technique, par Em. Vieberg. Brussels, 1922. 575 p.

Speculation and the Chicago board of trade, by J. E. Boyle. New York, Macmillan 1920. 277 p.

Quebec. Comite permanent de l'agriculture, de l'immigration et de la colonisation. Rapport sur l'opportunite de creer un credit agricole. Quebec, 1922. 239 p.

Cost of marketing grain; a history of certain carloads of grain from the farmer to the terminal buyer, by J. E. Boyle. 24 p.

The packing industry: a series of lectures given under the joint auspices of the School of commerce & administration of the University of Chicago & the Institute of American meat packers. Chicago, 1923.

Pruning, by W. J. Allen. Sydney, N.S.W., Dept. of agriculture, 1921. 191 p.

The pruning book, by R. B. Gilman. Philadelphia, Henry Disston & sons, 1921. 105 p. il.

British Basidiomycetes; a handbook to the larger British fungi, by C. Rea. Cambridge, University press, 1922. 799 p.

A bibliographic enumeration of Bornean plants, by E. D. Merrill. Singapore, Fraser & Neave, ltd. 1921. 637 p.

Botanical features of the Algerian Sahara, by W. A. Cannon. Washington, 1913. 81 p.

Culture des plantes medicinales, Paris, Publications agricoles de la Compagnie d'Orleans, 1922. 110 p. il.

New essentials of biology, by G. W. Hunter. New York, American book co. 1923. 453 p. il.

A real country teacher, by J. Field. Chicago, A. Flanagan co. 1922. 119 p.

Climatic changes; their nature and causes, by E. Huntington, Research associate in geography, Yale university, New Haven, Yale university press, 1922. 329 p

Elementary geology, by A. P. Coleman, Toronto, J. M. Dent & sons, 1922. 365 p.

The parliamentarian, by C. W. Trow. New York, The Gregg pub. co. 1920. 163 p.

History of agriculture in Wisconsin, by Joseph Schafer. Madison, State historical society of Wisconsin, 1922. 212 p. il.

The beginnings of agriculture in America, by L. Carrier. New York, McGraw-Hill book co. 1923. 323 p.

Rural Michigan, by L. A. Chase. Toronto, Macmillan co. 1922. 492 p. il.

From Newton to Einstein, by B. Harrow. New York, D. Van Nostrand co. 1920. 116 p.

Vade-mecum du forestier. Besancon, Imprimerie Jacques et Demonstrond, 1921. 192 p.

Mechanical devices in the home, by E. Allan. Peoria, Ill., The Manual Arts press, 1922. 251 p. il.

Constructing concrete porches, by A. A. Houghton. New York, Norman W. Henley publishing co. 1912. 62 p.

Trade and industry of Finland. Helsingfors, Finland, J. Simelius' Heirs printing co. 746 p.

Newfoundland, compiled by H. M. Mosdell. St. John's, 1920. 94 p. il.

L'Algerie et ses produits. Algiers, Syndicat commercial algerien, 1922. 209 p.

Syllabus of Japan, by K. S. Latourette. New York Japan society, inc. 1923. 44 p.

Tropical agriculture in Australia. Melbourne, Commonwealth immigration office, 1921. 32 p.

Humane horse-training, by P. F. Thorn. London, Hutchinson & co. 1922. 287 p.

Feeds and feeding; a handbook for the student and stockman, by W. A. Henry rewritten by F. B. Morrison; 18th ed. Madison, Henry-Morrison co. 1923. 770 p.

Dogs as home companions, by A. F. Hochwalt. Cincinnati, Sportman's digest, 1922. 129 p.

Breeders calendar and year book, 13th ed. 1923. New York, Field pub. corp. 1923. 151 p.

Outdoor opportunities. Kansas City, Mo., Outdoor enterprise publishing co. 1922. 256 p. il.

Poultry, by A. W. Richardson. New York, Harper, 1922. 152 p.

Line breeding for pigeon fancier, by E. R. B. Chapman. Chicago, American pigeon keeper. Chicago, American pigeon keeper, 1922. 32 p.

Harness repairing, by L. M. Roehl. Milwaukee, Wis., Bruce publishing co. 53 p.

Starting right with bees, by H. G. Rowe. Medina, O., A. I. Root co. 1922. 128 p. il.

Remarks on canning, by Sir F. A. Nicholson. Madras, 1921. 146 p.

A manual of American and European mammals. New York, Funk & Wagnalls co. 35 p.

Heredity in poultry, by R. C. Punnett. Toronto, Macmillan and co. 1923. 304 p.

The book of wild flowers for young people, by F. S. Mathews. New York, G. P. Putnam's sons, 1923. 397 p. il.

Fur facts, by A. M. Ahern. St. Louis, Mo., Funsten bros & co. 1922. 304 p.

Progressive agricultural programs, written and compiled by Mignon Quaw. Franklin, O., Eldridge entertainment house, 1922. 135 p.

Many roads to health, by M. K. Moriarty. New York, Child health organization of America, 1922. 63 p. il.

Manuel du laitier-cremier, by A. Corvez. Paris, Librairie J. B. Bailliere et fils, 1923. 307 p. il.

Elementary agriculture, by H. J. Waters. New York, Ginn & co. 1923. 349 p.

The school book of forestry, by C. L. Pack. Washington, The American tree association, 1922. 159 p. il.

Trees as good citizens, by C. L. Pack. Washington, The American tree association, 1922. 257 p. il

Manual in agriculture: making things, by F. L. Bennett. Pierre, S.D., J. F. Olander co. 1922. 155 p.

Principles of marketing, by F. E. Clark. Toronto, Macmillan, 1922. 570 p.

Soil conditions & plant growth, by E. J. Russell. Toronto, Longmans, 1921. 406 p.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

VISIT OF THEIR MAJESTIES KING GEORGE V. AND QUEEN MARY TO THE PALACE OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE, ROME, ITALY

On the 8th of May, 1923, Their Majesties King George V and Queen Mary, accompanied by Their Majesties the King and Queen of Italy, visited the Palace of the International Institute of Agriculture at Rome, Italy.

Their Majesties were received by the President of the Institute, the Honourable Senator Edoardo Pantano, and by the members of the Permanent Committee, including Sir Thomas Elliott, Bart., K.C.B., ex-Secretary for Agriculture for England and Delegate of Great Britain and the Dominions on the Permanent Committee of the Institute.

To the President's address of welcome His Majesty George V made the following reply:—

"I thank you, Mr. President, on behalf of the Queen and for myself, for your eloquent address, and I thank you gentlemen, Delegates of the Institute, for the cordial reception you have given us.

"Agriculture has a vital and universal importance, for it not only provides the immediate necessities of life, but it affords a firm foundation of social and political stability, and at the same time assures to the sober and industrious dwellers on the land a life under the most healthy and natural conditions.

"The welfare and prosperity of the agricultural communities are therefore the objects of the special solicitude of the Governments and peoples of all the countries. I personally follow with the closest attention the vicissitudes of agriculture, not only in the British Empire, but in the whole world.

"I am well aware that, aside from the ordinary uncertainties of agriculture, there are to-day special difficulties to be met on account of the instability of prices following the great war. My sympathies go out to my comrades of the farm in the efforts they are making and in the anxieties they are experiencing. But I do not despair. I have confidence that their traditional patience, courage and enterprise will triumph over the present crisis.

"After the ravages of the war, the way that leads to peace and prosperity is rough and tortuous, and perhaps the easiest and most direct way is to be found in that international co-operation so well followed for eighteen years by the International Institute of Agriculture. One of the chief functions of the Institute is to furnish the agriculturists of all countries with the most recent information, either practical or the result of scientific research. The necessity of this organization is from year to year more generally recognized throughout the British Empire, and the fact that both Governments and agriculturists have through it adopted the most modern methods promises well for the future of agriculture. There is evident in this beautiful land of Italy the same spirit of progress that exists in other countries. In this sphere, as in others, the work of the International Institute of Agriculture has a special value, and the Queen and I are happy to have this opportunity of inspecting it.

"I shall always closely follow the progress of the Institute, having faith that, with the generous assistance of His Majesty the King of Italy and with the co-operation of the adhering States, it will continue to render great services to the most essential and the most ancient of all occupations."—(*Translated from the French.*)

SCIENCE AND PRACTICE OF AGRICULTURE

GENERAL INFORMATION

The Radio-Telephone as a Means of Distributing Weather Forecasts, Crop Reports, and General Agricultural News. – I. *Journal of the Ministry of Agriculture*, London, Aug., 1922, p. 444.– II. *The Dakota Farmer*, March 1, 1923, p. 231.

In England, in France and in the United States the wireless telephone has already, to a more or less extent, been brought to the assistance of agriculture. The feasibility of using wireless telephoning in this connection has been amply proven, and the results have been satisfactory.

The British Air Ministry issues daily by means of radio broadcasting a number of weather reports of considerable use to the farmers, and a pamphlet giving particulars concerning these messages has been distributed. Special forecasts are also issued during the harvest season.

The National Meteorological Office of France broadcasts weather bulletins from the station on the Eiffel tower twice daily. Every commune is to have a receiving station in the parish school, police station, or at the home of some chosen person, where the messages will be received and posted. The messages are communicated in the district by the ringing of a bell –no ringing if there is no change of weather, three strokes to announce rain, six to announce frost, ten to announce storms or hail. In England, where the farm houses are more isolated than in France, it is proposed that the messages be received at suitably chosen towns, and redistributed from them to villages and to farms in possession of the cheap wireless receivers already at the disposal of the general community.

The United States Department of Agriculture has organized and developed a comprehensive radio programme that covers the entire country. This service includes market reports, weather information and general agricultural news. At the present time the radio crop and market news service of the Bureau of Agricultural Economics is handled by four high-powered radio-telegraph stations of the Navy Department, five strong radio-telegraph and one radio-telephone station of the Post Office Department, and 78 radio-telephone stations belonging to colleges, state agricultural departments, electrical companies, newspapers, stockyards, and other interested concerns.

In July 1922 there were 98 stations in 35 States broadcasting daily weather forecasts and warnings by radio-telephone. Weekly reports on the effect of weather on crops and highways, and other information issued by the Weather Bureau are also disseminated by the station.

An international weather information service and crop reporting service is also being built up. A daily radiogram is sent to the French Meteorological Service and broadcast from the Eiffel tower all over Europe. The Weather Bureau receives radio reports from European countries in exchange. Crop reports are exchanged with the International Institute of Agriculture at Rome and with the Egyptian Government.

Another service consists of a number of short speeches on various agricultural topics which are broadcast from the Naval Radio Station at Arlington, Va. Educational talks on all subjects pertaining to farming are broadcast by private stations.

The United States Department of Agriculture does not operate any wireless equipment, but the radio distribution work is carried on through stations operated by other Government Departments, by corporations, and by private individuals.

The prices being paid for cash grain as well as for grain for future delivery in the Exchange Room of the Chamber of Commerce of Minneapolis, are now being broadcast throughout the Northwest of the United States by radio. The following quotation from "The Co-operative Manager and Farmer," February, 1923, shows how this is done:—

"The Minneapolis Chamber of Commerce quotations are being broadcast through the courtesy of the Northwestern National Bank, one of the subscribers above mentioned. The time schedule of these quotations is as follows: At 9 : 40 a.m. the "opening" prices of grain and flax for "future delivery." At 10 : 30 and at 11 : 30 a.m. the "going" prices of grain and flax for "future delivery." At 1 : 30 p.m. the "official closing prices" of cash grain and flax, also grain and flax for future delivery. This schedule applies to every business day, including Saturday.

"A Western Union "ticker" or type recording telegraph instrument has been placed in the transmitting room of the Oak Grove station by the Chamber of Commerce Quotations Committee. This instrument is connected directly with the so-called piano grain ticker transmitter located in the Exchange Room of the Chamber of Commerce of Minneapolis. The operator of this piano grain ticker transmitter delivers to the Oak Grove station the grain prices above mentioned, and these prices appear in type upon the "tape" which is constantly issuing from the ticker in the Oak Grove station. The operator at the Oak Grove station immediately broadcasts these prices over the Northwest by radiophone."

The Chicago Board of Trade also broadcasts market and crop news from a powerful

sending station. In an article in the "Price Current-Grain Reporter," May 9, 1923, describing this service the author says:—

"It has always been a difficult problem for the farmer to choose what he considers the most opportune time to ship his grain. Usually he is not in a position to study the daily price changes, and certainly not on the very day the changes are taking place. By the new method the farmer is closely linked with his market. He may have, hot off the wires, the latest news that is likely to affect prices of grain and produce; he may have the freshest statistical information from Government and other crop reporting sources; he may have price quotations almost while they are being posted.

"Indeed, all the facilities of the vast crop-reporting system of the Chicago Board of Trade are now placed at the disposal of the farmer free of charge. And these facilities are one of the marvels of modern commerce."

Books on Radio in the Library of the Institute Branch.—To any reader who desires to build for himself a radio telephone set or otherwise acquire one and operate it, the Branch gladly extends the privilege of borrowing a number of the books mentioned hereunder, in so far as they are available at the time of request. In case the particular books asked for are loaned, others equally as good will, if possible, be substituted.

The Complete Amateur Radio Book, by M. J. Grainger. McClelland & Stewart, Toronto, 1922. 159 pp. illustrated.

Radio Phone Receiving, by E. Hausman. D. Van Nostrand Company, New York, 1922. 180 pp. illustrated.

Practical Wireless Telegraphy, by E. E. Bucher. 336 pp. illustrated. Wireless Press, New York, 1921. A complete text-book.

Radio For Beginners, by J. R. Cameron. The Technical Book Company, New York, 1922. 160 pp. illustrated.

Radio for the Amateur, by A. H. Packer. The Goodheart-Wilcox Company, Chicago, 1922. 207 pp. illustrated.

1011.—Influence of the Weight and Size of Seeds on Yield.—DESPREZ, F., in *Journal d'Agriculture pratique*, Year 86, No. 7, pp. 141-143. Paris, Feb. 18, 1922.

It has always been admitted that the largest and heaviest seeds gave the best cultural results.

Varro, Columella, Pliny and in more recent times Olivier de Serres, P. Joigneaux, Schribaux, etc., have recommended this mechanical selection for obtaining the most vigorous plants and the greatest yield. Some agriculturists however, have attributed but slight importance to these characters of the seed. Thus, the Belgian agriculturist De Caluwe published a pamphlet in 1908 in which he set out the results of experiments carried out at the "Jardin d'Essais" at Ghent with oats and barleys which were unfavourable to large seeds. Further, basing his conclusions on tests made by Janneson, of the Glasterberry Station in Scotland, by Th. Remy, of the Agricultural College of Bonn-Poppeledorf in Germany, and others he came to the conclusion that the results of practical and carefully arranged experiments tended to negative the superiority of large heavy seeds.

The writer refers to some experiments made by him since 1896 at the Agricultural Experimental Station of Cappelle (Nord) with 5 varieties of wheat sown on 5 plots of an area of 50 acres each; one half of each plot was sown with large seed and the other with small. The superiority of the large seeds, so far as the yield of grain calculated by weight was concerned, was evident and in some cases very marked. The difference was greatest in the case of a yellow bearded wheat for which the large seed gave a yield of 70 bushels per acre and the small seeds a yield of 57 bushels, a difference of 13 bushels per acre. For the other varieties, the difference, though less marked, was still considerable. The specific gravity of the grain (weight of 1 hl. expressed in kg.) was the same for two varieties and for the other three, that of the large grain was slightly greater than that of the small grain. There was no appreciable difference in the weight of the straw.

In 1922 fresh experiments were undertaken at the Cappelle Station with oats and barley so as to have them under conditions identical with those of De Caluwe.

CROPS AND CULTIVATION

1012.—Critical Period of Wheat as Regards Rain.—AZZI, G., in *Nuovi Annali del Ministero per l'Agricoltura*, Year I, No. 2, pp. 299-307. Rome, Dec. 31, 1921.

In the development of cereals critical periods are encountered during which the plant feels most acutely the unfavourable effects of its environment, such as drought.

In the case of wheat the greatest need of moisture is felt; (1) during germination and the initial growth of the young plants; (2) during growth; (3) during the period of earing. The critical period for the formation of ears was previously determined by the writer by means of the formula of correlation and by making use of statistical, meteorological and phenological data ascertained for the Province of Girgenti. It follows that the period of about twenty days required to form ears is of capital importance; if, during this period the total amount of atmospheric precipitation is less than the minimum compatible with the normal development of the plant, the harvest will be poor, even if

rain falls during the remainder of the growth period. Wheat can give good crops even with a total rainfall of less than 12 inches; but as the minimum is approached the influence of the distribution of the rainfall prevails and becomes decisive during the critical period.

In this connection the writer has investigated experimentally 4 varieties of wheat: *Apulia* (Rietta X Spelta), *Cervaro*, *Carlotta Strampelli* (Rietta X Massy) and *Spelta*. The experiment was carried out at the Botanical Garden of the University of Rome during the agricultural year 1920-21. The plants were grown in pots; copiously watered from sowing on December 29 up to April 12, and from the 7th day after forming ears up to maturity; during the interval, on the other hand, the plants were given a variable number of waterings: 0—1—2 —5. The best selected varieties, of high specific productivity, *Spelta* and *Carlotta*, suffered most from the absence or slightness of the watering, the two other varieties were less exacting.

The harmful effect of insufficiency of water during the critical period is shown by:—the total production of grain expressed in weight—the average weight of the grains—the length of the stalks—the length of ears—the weight of straw—etc. There was also a delay in earing and reaching maturity, more noticeable for the selected varieties, especially *Carlotta Strampelli*. The length of the ears did not diminish correlatively with the length of the stalk; on the contrary, in the variety *Apulia*, in spite of want of moisture they maintained an almost invariable length. This capacity of decreasing the length of stalk while maintaining the length of ear unchanged, may be interpreted as a character of adaptation to drought.

With the varieties *Spelta* and *Carlotta*, not even as many as 5 waterings *made in the conditions of the experiment* were sufficient for them to reach the production of the two other varieties.

Production therefore depends on two factors; specific productivity and resistance to the unfavourable conditions of environment. In the 4 varieties studied, these two factors were more pronounced in the *more hardy* varieties. The variety *Cervaro* especially seems to unite in the best proportions the characters of specific productivity and resistance to drought; it is well suited to a dry climate.

Adaptation to drought may arise:—(1) by advancing or retarding the formation of ears so as to alter the critical period; (2) if the roots are deep; (3) if the structure of the plant is such as to enable it to economize moisture. This last is true resistance to drought, and the real object of these experiments.

1022. —Soil Fatigue.—D'HUBERT, A., in *Journal d'Agriculture pratique*, Year 86, No. 7, pp. 136-138. Paris, Feb. 18, 1922.

The writer defines the fertility of a good soil as its capacity to produce vegetable matter, independently of its chemical composition. Decrease of fertility has been attributed to several causes:—

(1) The most simple hypothesis is the soil's exhaustion in nutritive matter. Recent research has shown that this is not adequate, for the composition of soil solutions is, if not constant, at least almost invariable.

(2) Another explanation of soil fatigue is furnished by Russell and his collaborators who bring in *antagonism between the germs in the soil*, in which the injurious germs get the better of the useful germs. The former class is represented mainly by protozoa, which by phagocytosis would destroy the latter, represented chiefly by *Azotobacter*. The exhaustion of the fertility of the soil would be due to the rapid increase of the protozoa. This is perfectly correct when it is a matter of crops *in vitro*, but, in nature, protozoa and *Azotobacters* play a secondary part relatively to other living agents. Moreover this hypothesis does not explain why a particular crop e.g. lucerne, cannot be grown again on the same ground except after a certain period of repose.

(3) *The injurious effect exercised by the organic residues* left by the plant in the soil is another suggested explanation. These residues may be either dead roots, or pellioles coming from the desquamation of the live roots. In this order of ideas, Prianichnikow and Peritourine have proved experimentally that the introduction of fragments of roots into a pot of screened soil reduces the yield. The writer has repeated this experiment under conditions permitting a more rigorous comparison. As soil is too complex a medium for it to be possible to study in it each of the factors which regulate vegetation, he preferred to make use of a sterilized nutritive liquid, in which he grew maize, following the method suggested by Mazé. Three series of experiments were made:—one series grown in a liquid which had not yet borne any crop, one series in a liquid which had already borne a crop of maize, one series in a fresh liquid, but into which fragments of roots had been introduced.

The average lengths of stalk and roots showed marked increases from the 1st to the 2nd and from the 2nd to the 3rd series; they were respectively 2·4 and 1·6 inches, 5·3 and 7·1 inches, 4·9 and 7·9 inches. It is therefore possible to conclude that, at least in the case of young plants, the presence of the dead roots of a plant is very favourable to and does not hinder growth.

(4) There remains a fourth hypothesis, closely connected with the last, namely that the plant *elaborates waste products injurious* to itself, which check the development of plants of the same species, behaving like toxins. Although this hypothesis is still slightly inconsistent, it alone can explain several facts.

It is supported by Whitney, who quotes the following commonly observed fact: beneath the trees on a lawn there is no vegetation, and the grass disappears. This lack of vegetation is not due to shade for it would then be observed only under the north part of the tree, where the shade is more persistent; but this is not the case, the lack of vegetation being uniform under the crown of the tree. This lack of vegetation is also not due to exhaustion of the soil by the roots of the tree, either in nutritive matter or in moisture, for, whatever amount of manure and water is given, the soil does not recover its fertility. This is therefore in all probability due to the excretion, by the leaves, of injurious substances which the rain carries down to the ground below. It must also be remembered that acid soils are infertile; now acidity in itself, is not injurious; in fact cultures in liquid media require an acid reaction; nor can it be stated that acidity is injurious as checking the process of nitrification; in fact the plant assimilates ammoniacal nitrogen as well as nitric nitrogen; it follows that acidity is merely an indication of the presence of injurious substances.

Applications.—This hypothesis has led to a practical application for ascertaining the nutritive value of a soil. The method recommended by Whitney consists of rapid comparative experiments of growth, made so as to shield the soil against the action of oxygen which would destroy the vegetable toxins, which are highly liable to oxidization. With this object, the soil tests are made in metal pots steeped in melted paraffin; the experiment lasts only 2 or 3 weeks; the weights of the crops are then taken. By adding manures to the soil it can be ascertained which is the more suitable. The soil Bureau of the United States has used this method for more than 10 years; it is not absolute, but, in practice, its results agree with those given by cultures in the field and chemical analyses do not always give such satisfactory results. It is desirable that further research should be made regarding the nature of the supposed toxic substances and the right means of destroying them. Up to the present time the use of carbon disulphide, toluen, calcium sulphide and heat have been tried empirically; but a strict scientific study is required.

922.—Influence of Irrigation on the Composition of the Soil.—Greaves, J. E., in *Journal of the American Society of Agronomy*, Vol. 14, No. 5, pp. 207-212, bibliography of 7 works. Geneva, N.Y., May, 1922.

Water has a double action on the soil. It assists or hinders the normal development of the processes in the soil, and its most manifest influence is over the process of nitrification, of which the maximum is attained when the soil contains 60 per cent of its water-holding capacity. Above or below this concentration, there is a decrease; and nitrification ceases when the quantity of water reaches or exceeds 90 per cent. As regards nitrification, therefore, an excess of water is more detrimental than an insufficiency. Under good moisture conditions, from 50 to 100 lb. of nitric acid may be produced in an acre of soil during a season; it is a well-known fact that this acid is of great assistance in the liberation of phosphorus and potassium. The moisture content acts similarly, but in a less degree, on ammonification, the maximum production of which is also reached when the soil contains 60 per cent of its total water-holding capacity. All the other processes which take place in the soil are also dependent on its water content; for instance, the production of carbonic acid gas; it also plays an important part in the solution of tricalcium phosphate. Finally, it influences the production of lactic, acetic, butyric, sulphuric, and other acids, which help to dissolve potassium, etc.

The other fundamental action of irrigation water is that it brings or carries away plant food; it impoverishes or enriches the soil. To gain an idea of the enormous quantity of substances that water may carry off from the soil, it is only necessary to consider the constituents of river water. The substances in solution such as for instance, sodium chloride are not generally of any importance in agriculture, but useful substances, such as potassium, nitrogen and phosphorus, are not lacking. The writer describes certain analyses on this question. Some irrigation drain waters are still richer; certain of them contain as much as 133 pounds per acre-foot.

When irrigation is carried out properly, the water, as it evaporates, deposits the substances it contains, as in the case of the Nile. Thus, in Utah, the waters used for irrigation contain 0·79 to 59·0 parts of potassium per million, or an average of 5 parts which may be used by the soil. Irrigation waters contain besides potassium, nitrogen and other useful soluble substances;

they are therefore capable of improving the soil. The great point is to irrigate *in moderation* in order not to *wash out* the soil. Irrigation may transform the desert into a garden or render the most productive fields barren, according as it is well or ill done.

924.—The Sowing of Seeds and Scattering of Chemical Fertilizers Simultaneously in Parallel and Close Lines.—Bandry, A., in *Comptes Rendus des seances de l'Academie d'agriculture de France*, Vol. 8, No. 20, pp. 574-580. Paris, 1922.

Low crop yield is due less to the insufficiency of chemical fertilizers used than to their imperfect utilization by the crops. It was decided to place within immediate reach of the young plants the mineral nutriment needed by them from the earliest stages of their growth. For 15 consecutive years the author studied the application to extensive cultures of the simultaneous scattering of chemical fertilizer and seed grain in close parallel lines. The results obtained are as follows:

(1) The maximum profit in practice from crops, both of cereals and pulse, has always been obtained by using quantities of chemical fertilizers varying from 270 to 360 lb. per acre.

(2) With more than 360 lb. of chemical fertilizer the value of the increase in weight of the crops did not correspond with that of the increase in weight of the chemical fertilizers used.

(3) The yield per acre of useful dry matter from the crops obtained by using 180 to 360 lbs. of chemical fertilizers spread in lines has been at least equal and often superior to that obtained on the same soil by using 540 to 900 lbs. of the same fertilizers distributed in the usual way.

(4) Chemical fertilizers sown in lines at a depth of 1 to 1¼ inches in close proximity to the seed have a beneficial effect on the young plants.

The author concludes that this method of rational utilization of chemical fertilizers is so effective that it has become possible to reduce the quantities hitherto judged necessary to ensure the maximum practical profit from crops by 50 to 60 per cent.

925.—Thirty Years of Field Experiments With Crop Rotation, Manure and Fertilizers.—Miller, M. F., and Hudelson, S. R., in *Missouri Agricultural Experiment Station Bulletin*, No. 182, pp. 1-43. Columbia, Missouri, April, 1921.

The authors proposed to ascertain the effects of crop rotation and continuous cropping upon unmanured and manured soil respectively. They realized that experiments over a long period are necessary in order to reduce to a minimum the influence of seasonal variation and to secure reliable results from the various rotations.

The data here reported include the results of 30 years experiments (1888-1918) with different systems of crops, manures, and fertilizers, designed to ascertain not only the effect upon crop yields, but also upon the soil.

The soil of the experiment field was a silt loam of a dark brownish grey colour, the surface drainage was generally good and the soil fairly uniform in fertility. The field was divided into 39 tenth-acre plots at first, though these were afterwards reduced to one-thirteenth acre and subsequently to one-fourteenth acre. The plots were planted with continuous crops and rotations of maize, oats, wheat, clover and timothy.

These crops were grown at the same time on untreated plots, on plots given manure, plots given chemical fertilizers such as nitrate of soda, muriate of potash and superphosphate, as well as on plots receiving both manure and fertilizers.

The applications of manure were much larger than is usual on the average farm (7-9 tons per acre); hence the effects upon the soil and crops were intensified, but weed growth was encouraged so that the grass and clover crops sown with the crops were smothered, and lodging was induced in wheat and oats.

The fertilizer treatment was based on the quantitative chemical analyses of the crops, the different elements being added in the same proportions that they were removed in maximum crops. The plot on which wheat was continually grown received sufficient nitrogen, phosphorus and potassium to equal the amounts contained in a 40 bushel wheat crop and the accompanying straw.

From the experimental data collected by the authors it appears that:

(1) *on untreated soil*, rotation gave very superior results to continuous cropping. In the case of maize, the yield is increased by lengthening the period between the crops, as is shown by the following figures:

20·9 bushels with continuous cropping.
32·6 " " 3 years' rotation.
38·5 " " 4 " "
41·5 " " 6 " "

In the case of the other crops, the maximum yield is obtained from 4 years' rotation.

In the opinion of the authors, the low yield obtained by continuous cropping is due to several factors among which are insect enemies, weeds and disease, which are all favoured by growing the same crop on the same field year after year.

(2) *On soil treated with manure* so as to maintain its fertility, rotation gave better results than continuous cropping, although the differences in the yields of the various crops were not so great as in the case of the experiments carried out on unmanured soil.

The use of manure greatly increased the yield of continuous crops, especially in the cases of maize, wheat and oats, the average increase recorded being as follows:

Maize....	14·0 bushels	per annum per acre
Oats....	10·4 "	"
Wheat ..	8·6 "	"
Clover. .	827 lbs. "	"
Timothy.	2,325 "	"

The above figures show the high value of manure on wheat, maize and timothy, the effect on continuous clover not being so good.

In the course of the long experiment period, it was found that a three year rotation on an unmanured soil gives lower yields than are obtained from continuous crops on manured ground, whereas with a long rotation (4-6 years), better results are obtained than from continuous crops grown on manured soil. Judging from the soil analysis, it is evident however that manure is more effective than rotation in maintaining the fertility of the soil. In fact, although by means of careful rotation it is possible to some extent, to relieve soil exhaustion all the elements required cannot be supplied by this means. A combination of rotation and manure is best.

(3) *On soils treated with chemical fertilizers* the yield of the crops was kept up as well as when manure was used. On comparing the different results obtained it is seen that maize does better with manure, but wheat and oats are better with fertilizer In general, this relative response of the different crops to manure and fertilizer agrees with the results of numerous other experiments made at the Missouri Experiment Station and at the Rothamsted Experiment Station in England, and the Pennsylvania Experiment Station.

Chemical fertilizers, especially phosphates, are particularly to be recommended for wheat.

In the case of plots receiving fertilizers only, even in the one cropped continuously with wheat the soil was not appreciably more compact than that of similarly cropped plots without treatment, contrary to the generally received opinion that large quantities of sodium nitrate tend to deteriorate the soil texture.

(4) *On soil treated with half-manure and half fertilizer*, better results were obtained than with chemical fertilizers alone; therefore mixed fertilizers are the best to employ as they also maintain the soil fertility. To determine the effect exerted on the soil by different methods of cropping, the authors had recourse to chemical analysis. At the end of 25 years samples were removed from the different plots and the nitrogen content was taken as an indicator of the amount of organic matter in the soil. Maize was found to be the most exhaustive crop as regards the nitrogen, after which come oats and wheat. Timothy appears to exhaust the soil least. As a rule, rotations are less exhaustive of soil nitrogen than any single crop. This may be due to nitrogen fixation by bacterial agency.

Chemical fertilizers, even when used in large quantities, did not keep up the soil nitrogen. Evidently most of the nitrogen not immediately used by the crop was removed by leaching, or denitrification. Manure on the other hand proved very effective in maintaining the nitrogen supply.

This long series of experiments proved that, in general, *crop rotation gives better results than continuous crops.* Among the rotations used the four-year rotation of maize, oats, wheat and clover gave somewhat better results than the others. In order to obtain good crops the soil must also be manured. As a rule, farmyard-manure and chemical fertilizers proved of about the same value from the point of view of crop yield, but farmyard manure was more effective in maintaining the fertility of the soil.

The application of a mixed fertilizer has proved to be the best method to maintain heavy crop yields without exhaustion of the land.

1145.—The Value of Tetraphosphate as a Fertilizer.- Hudig, J., and Meiger, C., in *Verslagen van Landbouwkundige Onderzoekingen der Rykslandbouwproefstations*, No. XXV, pp. 140-159. Gravenhage, 1921.

The authors describe the circumstances which led to the starting of the tetraphosphate industry, the methods of manufacture and the success or non-success of this wartime fertilizer up to the present day. The fertilizer does not require sulphuric acid in its preparation and any quality of phosphates can be used, even such as are not suitable for the manufacture of superphosphates.

After referring to the reports of Menozzi and Belluci, the authors describe the investigations they have made respecting the value of tetraphosphate. The first experiment was made with oats grown in pure sand, in pots; these were given, as fertilizers, chloride of potash and magnesium sulphate; one set of these cultures were given nitrogen fertilizer in the form of nitrate of soda and the other nitrate of ammonium. The eight pots of each of these two sets received respectively as phosphatic manure; phosphate soluble in water—phosphate only slightly soluble—insoluble phosphate—low grade crude phosphate—high grade crude phosphate—the same high grade crude phosphate, heated to 700°C. and rapidly cooled—tetraphosphate—no phosphate at all. These experiments have shown that in a slightly acid medium, tetraphosphate and

the two other crude phosphates are of value The favourable results obtained with tetraphosphate on rice plantations may probably be attributed to the acidity of the soil The fact that Menozzi obtained unfavourable results was probably due to the fact that the soil used in his experiments contained a sufficiency of phosphates, or to its alkaline reaction The cultures failed when grown in an alkaline medium with crude phosphate

A second study was made by the authors by carrying out comparative field experiments with 17 per cent superphosphate, 18 per cent French, Somme phosphate and tetraphosphate containing 26 per cent of phosphoric acid These trials showed that

(1) in alluvial soils tetraphosphate and Somme phosphate were equivalent, although in sands of the "Anna Paulownapolder" tetraphosphate was superior to French phosphate

(2) in roodoorngrond super and tetraphosphate gave an increase of 13 per cent in yield

(3) In the 22 cultures in sandy soil which responded to tetraphosphate 6 gave a better yield with the tetraphosphate than with Somme phosphate of these 6 cultures three gave higher yields with tetraphosphate than when super was used in the remaining three cases the two fertilizers proved to be equally effective

These results were obtained with cultures of red clover lupins peas, and oats On the other hand with cereals and potatoes 4 instances were recorded in which tetraphosphate was inferior to crude phosphate

The authors summarize their work as follows

(1) In sandy soils which had received a manure with an alkaline reaction tetraphosphate did not give such good results as ground crude phosphate and was decidedly inferior to soluble phosphate

(2) In sandy soils to which had been added a manure with an acid reaction tetraphosphate gave good results the best however were those with crude, ground phosphate The yield with tetraphosphate was the same as that obtained with soluble phosphate

(3) In the cases where tetraphosphate proved superior to superphosphate the results must be attributed to the acidity of the soil which caused the superphosphate to be ineffective and to certain unknown factors in connection with plant requirements and soil reactions

1024 —Production of Phosphoric Acid by the Method of Electric Condensation and Precipitation —SWANN, T, in *Industrial and Engineering Chemistry*, Vol 14, No 7, pp 630-631 Washington, July 1922

Up to the present phosphoric acid has generally been prepared by the treatment of mineral phosphates or bones with sulphuric acid The new method by electric precipitation, is actually in use at Anniston (Alabama U S), where three electric ovens are employed, which require a power of 10,000 H P and 44 000 volts

This method consists in fusing in the electric oven a mixture of crude phosphate, coke sand and iron shavings The phosphorus which by this means is set free combines partly with the iron and forms iron phosphide containing 25 per cent of phosphorus and part volatilizes with other gases in the oven and is oxidized in the air, the phosphoric acid of 90 95 per cent concentration is collected in specially designed condensers, after which it is refined by special methods The particular advantage of this process consists in the production of a highly concentrated acid which is almost free from iron as all the iron contained in the phosphorite separates out in the form of phosphide The acid is sent out in barrels or in transport tanks lined on the inside with a special acid resistant wax compound For pharmaceutical purposes it is necessary to recrystallize the acid as by this means a purity of 90 per cent can be obtained for medicinal use or for making oxygenated water

This process has already been applied to the manufacture of fertilizers for which purpose a great expansion can be foreseen

Fertilizers have already been produced containing ammonia phosphoric acid and potash with a fertilizing power five times that of the ordinary product

There should be some means of safeguarding the use of such a concentrated fertilizer but this concentration will effect a great saving on freight, and it will also be possible to reduce the cost of the fertilizer In order to fix ammonia it will be an advantage to replace sulphuric acid by phosphoric acid and in this way to produce a fertilizer which will contain two of the three essential fertilizing elements

1036 The Role of Manganese in Plants —McHARGUE, J S in *The Journal of the American Chemical Society*, Vol 44 No 7 pp 1592 1598 Washington, July 1922

The presence of manganese in the soil and in the ash of plants was detected by Scheele in 1774, but during the nineteenth century few researches were made as to the function of this element Mention should be made of the work of Bertrand (1897) and of Brenchley (1914) who concluded that the manganese is an element essential to the economy of plant life During the last 20 years considerable attention has been given to the agricultural problem of manganese and the author knows of as many as 150 investigations on the subject

While engaged on botanical research work necessitating a test for manganese, the

author found that the latter is present in the seeds of many plants, and especially in the seed-coats, the integument of wheat containing approximately 0·02 per cent of its dry weight of manganese. This induced him to make investigations for the purpose of determining the functions of manganese by growing seedlings in Pfeiffer's nutrient solution after carefully removing all trace of manganese from the compounds used in its preparation. This precaution was necessary as in previous experiments the calcium magnesium and iron salts used as plant nutrients were found to have contained the small percentage of manganese required by the seedlings. Several lots of wheat were grown, some with and others without manganese. No difference between them was noticed for the first 6 or 8 weeks, but a little later the plants deprived of manganese behaved very differently from the others; their leaves, owing to lack of chlorophyll, became yellowish-green instead of deep green. The differences between the two sets of plants increased as they approached maturity, those without manganese made a stunted growth and produced no seed. The dry weight of the plants given manganese exceeded by 135 per cent that of those deprived the element.

Other experiments were made with Alaska peas with very similar results. When analyzed, the plants that had received manganese were found to contain 0·179 per cent of this element, whereas those to which no manganese had been added showed only traces derived probably from the seeds. The importance of manganese to plant development was also proved by growing several different species on sand; at the present time there are 20 different series of experiments in progress on the subject.

It may be assumed that the small quantity of manganese always present in the seed is sufficient to maintain a normal metabolic process during the first few weeks of growth; afterwards the manganese is used up in the formation of new tissues and plants that do not receive a further supply of this necessary element become chlorotic. The first change to be noted is a lack in the development of chlorophyll in the lately formed tissues and the growing parts; finally the tips of the branches die back, and the plant almost ceases to develop further.

It appears that leguminous plants are more sensitive to want of manganese than non-legumes; this suggests that the element is concerned in nitrogen assimilation and the synthesis of proteins. Manganese apparently plays the part of a necessary catalyst in plant metabolism, and together with iron, functions in the synthesis of chlorophyll.

934.—Supplies of Nitrogen Fertilizers.—HASKELL, S. B., in *Journal of the American Society of Agronomy*, Vol. 14, No. 5, pp. 167-175. Geneva, N.Y., May 1922.

A comparison of the data collected for 1918 with that of other years has led the author to estimate that approximately one-half of the total supply of fertilizer nitrogen is derived from organic sources and the remaining half from mineral products. There is a tendency, however, for the consumption of organic nitrogen to decrease and that of mineral nitrogen to increase. Cottonseed meal supplies less than one-fourth of the fertilizer nitrogen, which would be better used as a livestock feed which should be encouraged. Dried blood, leather waste, tankage (coming partly from Argentina), fish by-products, etc., are other sources of nitrogen.

Five-eighths of the mineral nitrogen fertilizer is furnished by nitrate of soda; the importation is on the decrease, and some solution must be found.

The remainder is supplied from cyanamide and sulphate of ammonia, etc. The cyanamide is obtained chiefly in Canada, from the American plant which uses the Niagara Falls as a source of power.

The great bulk of the sulphate of ammonia is derived from the by product of the coke ovens. The consumption of by-products is continually on the increase. The author strongly recommends a more systematic use of available resources.

947.—The Effect of Nitrates Applied at Different Stages of Growth on the Yield, Composition and Quality of Wheat.—DAVIDSON, J., in the *Journal of the American Society of Agronomy*, Vol. 14, No. 4, pp. 118-122. Geneva, N.Y., April 15, 1922.

An experiment made by the author in collaboration with La Clerc showed that the application of sodium nitrate during the early period of growth increased the yield of wheat; when applied at the time of heading the quality of the grain was improved, but the use of nitrate at the beginning of the milk stage had no effect either on yield or the quality of the crop. The experiment was carried out in the year 1919 at College Park, Maryland. The period between the resumption of the growth of wheat in the spring and the time of heading was divided into three sub-periods. Each of three corresponding sets of plots received nitrate of soda or nitrate of calcium at one of these sub-periods; the experiments were repeated to make sure of the effect of the nitrates; the number of plots was thirty-six.

The effect of nitrate in increasing the yield decreases consistently as the time of

their application approaches the stage of heading.

The effect of nitrates in increasing the protein content (N x 5·7) of the grain increases as the effect on yield decreases. The deeper colour of the grain showed qualitative modification.

1037.— Influence of Lime on Germination.— MAQUENNE, L., and CERIGHELLI, R., in *Comptes rendus de l'Academie des Sciences*, Vol. 17, No. 20, pp. 1270-1272. Paris, May 15, 1922.

Maquenne in collaboration with Demoussy, has shown that lime is indispensable to germination; even in very small quantities it triples the length of the roots of peas in 6 days when compared with pure water cultures

The writers have examined the question again and made weight tests independently of tests by length, and extended their experiments to various kinds of seeds, namely: peas, wheat, lentil, cabbage, cabbage lettuce, radish, buckwheat and maize. The seeds were washed in sterilized water for 24 hours and the maize seeds sterilized with a 2 per 1,000 solution of sublimate. They were then made to germinate in sand soaked in pure distilled water. After 2 or 3 days they were treated partly with pure distilled water and partly with a 1 millionth solution of sulphate of lime in very weak proportions, similar to those obtained by heating pure water in a burnt clay beaker, which corresponds to about 1-25 of the lime contained in Paris spring water. The growth took place partly in water or in a calcic solution, partly in sand soaked in water or solution. The temperature was maintained at about 20°C. and the experiments were made in the dark. They were continued as long as growth of the young plants in the calcic solution lasted, while the growth of the plants in pure water ceased much earlier.

The favourable action of lime on growth was confirmed for all the seeds, both as regards length and weight. The action was more marked in the roots than in the stalks. At the same time there was a total loss of dry matter, without doubt caused by the fact that respiration had become more active in the calcic solution owing to the larger growth of the young plant and was not compensated by photosynthesis, as growth took place in the dark. Maize alone seemed to be an exception, perhaps, on account of the abundance of its reserves. The reserves were used in unequal proportions, both absolutely and in proportion to final weight, which is in agreement with the earlier observations of Mazé. In the seeds of cabbage, buckwheat and radish, the reserves diminished to a slightly less degree than in the control; consequently the writer suspects some errors in the experiments. In the others the diminution was more marked. In any case, lime exerts slight influence on the organization of the reserves, which proves that it does not act of its own accord on respiration.

1050.—Action of Various Manures on Beans. —VAN HAUTEN, in *Journal fur Landwirtschaft*, Vol. 70, No. 1, pp. 1-7. Berlin, July 1922.

Autumn sowings were made in 8 plots, which had already been manured in previous years and in which the last crop had been barley; they contained average amounts of phosphates and lime. Spring manuring was given with 50 per cent potassic salt, sulphate of ammonia and basic slag variously compounded.

During growth the lack of potash was already revealed in the plots to which no potassic fertilizer had been applied; the plants did not flourish and the leaves turned yellow, these differences becoming more marked after flowering. In the plots which were defective in potash, maturation was earlier, but the yield lower; on the other hand manuring with potash caused the yield to show a constant increase though to a less degree when manuring with potash was accompanied by manuring with phosphates Nitrogenous fertilizers did not have any beneficial effect, which is to be explained by the fact that the beans are able to supply themselves with nitrogen. Phosphatic fertilizers were clearly injurious, evidently because the soil was already over supplied. The yield, in quintals per hectare, was as follows: control 12·20--with potassic fertilizer 16—with phosphatic 11·40—with nitrogenous 10—with potassic and nitrogenous 16—with potassic and phosphatic 13—with phosphatic and nitrogenous 8—with the three fertilizers combined 15·60.

At the same station, Fest had obtained, in 1908, a similar result with the same fertilizers. In estimating the yield in dry matter, the general results are not modified appreciably. The average size of the seeds was very nearly the same, their weights varied from 36·23 to 41·01 gm. per 100 seeds.

The percentage of crude protein was less in the seeds of the potash plots, because, in the latter stages of maturation, the non-nitrogenous extracts are preferentially deposited in the seeds. In the potash plots, the maturation of the seeds and consequently the deposit of the non-nitrogenous substances, could be completely effected. Absolutely, however, the amount of protein was greater in the potash plots.

Contrary results were given for starch and fats. On the other hand, the percentage of ash was greater in the potash plots, and potash in large quantities was found in the ash.

814.—Experiments on the Use of Artificial Light in the Growth of Plants in Germany. — HOSTERMANN, in *Verein Deutscher Ingenieure*, Vol. XVI, pp. 523. Berlin, May 27, 1922.

The first experiments on the use of electric light for inducing the growth of plants were made in 1880 by Wilhelm Siemens, with a 1,600 candle-power arc lamp; these experiments were next reproduced at Bromberg by means of arc lamps and mercury lamps with unsatisfactory results; on the other hand experiments made in England and Ireland in 1919 by Tjebhes and Uthoff induced an increased yield up to 50 per cent. In the buildings of the Experimental Station of plant physiology at Dahlem (Germany), experiments were made during the winter of 1921-22, to ascertain the influence of artificial light on the growth of plants in glass frames; in winter, in a heated place, the difference of growth of plants, compared with the summer, is determined not only by the temperature and by the manuring which may be the same at both seasons, but also by the duration of daylight; in fact, it is the light absorbed by the chlorophyll which furnishes the energy required for the reduction of carbonic acid into carbon, from which carbohydrates are produced through assimilation. But it is not only daylight which exercises a beneficial action on the process of assimilation; this action can also be exercised by light coming from another source, provided that it is comprised in the category of wave lengths in the compass of which the colouring matters of the leaves have a power of absorption. The question is to select the light which will give the best return.

According to what can be deduced from researches on the physiology of plants, with a luminous intensity of about 1000 Lux, the assimilation may be considered as proportional to the illumination, while with a more intense light, assimilation is less and less accelerated and this is why artificial light was not used simultaneously with the winter light, but the day's light was prolonged from dusk by means of an electric current.

Over a plot 16 ft. long by 5 ft. broad were arranged 5 "Nitra" lamps of 200 watts, in such a way that the light could be diffused as uniformly as possible; the lamps were placed 27½ inches from the edge of the plot, at a distance of 47 inches from each other at a height of 23½ inches above the plot, and were furnished with Wiskott reflectors. The intensity of the illumination of the plants varied over different points of the surface of the plot from 300 to 900 Lux, and was exactly 900 Lux under the lamp and 300 at the edge of the plot. The daily consumption of electric power by the lamps, lighted for about 6 hours every day commencing at dusk, amounted to 4·8 kilowatt-hours for lighting a surface of 75 sq. ft. Forced cultures were made on that surface; the preceding period of vegetation of some of them had already made it possible to have an idea of the principles assimilated; others, having just germinated had still to construct their vital elements. Close to the plot of illuminated plants was the control plot, with the same plants and separated from the former by a partition of white wood; this plot, except for light, received the same care as that of the illuminated plants.

Cabbage-lettuces, illuminated from mid-November, had after 12 days on an average about two and a half times as many fresh leaves as those not illuminated; moreover, the leaves of the former were larger and firmer. Plants exposed only to daylight required from 4 to 5 weeks, or double the time to attain this degree of development; it would therefore be possible, in practice, to obtain in the same period of time two crops of lettuce instead of one. In 18 days the consumption per lamp was 21·6 kilowatt-hours.

To examine its subsequent growth, the lettuce was left in its place, since it did not flower but continued only to grow. However this very probably, should not be attributed to lack of power of the electric light relatively to solar light, but more especially to the richness of the artificial light in red rays, compared with daylight. The crop was gathered after 7 weeks of prolonged illumination; a comparison was then made between the plants of the illuminated plots and those of the plot not illuminated; a superiority of weight of the former over the latter of 50 per cent in the green state and 68 per cent in the dried was found.

The effect was equally good on beans and vetches. *Lathyrus odoratus* grew much more vigorously under the influence of the illumination and it flowered earlier and more abundantly. Strawberry plants illuminated yielded, as early as the middle of March, very sweet and scented fruit, while those not illuminated were 4 weeks later. The favourable effect of electric light in the prolongation of the short daylight from November to May, was very clearly shown on all greenhouse crops and especially on lilac which gave very fine inflorescences under this treatment, with more intense perfume and brighter colour. But certain data are lacking regarding:—(1) the most correct and suitable illumination for certain species of plants; (2) the duration of illumination; (3) the most favourable colours of the light; hence without exact knowledge of the sources of light and of the physiological effects of the light, it is not yet possible to form a correct judgment.

1057.—Mangolds in Combination With Maize.—Succi, A., in *L'Italia agricola*, Year 50, No. 8, pp. 265-268. Piacenza, August, 1922.

The writer calls attention to the economic advantage of growing mangolds mixed with maize, a combination which he has tried with success for about twenty years. The mangolds are sown between the lines of maize and at the same time or a little earlier. The two plants spring up and grow together; the maize then develops rapidly and the growth of the mangolds gradually slows down until it stops completely; by degrees as the maize begins to ripen the pressure is eased and the mangolds again begin to grow and after the maize is harvested, develop quite normally.

At this time, the beginning of autumn, the soil is the seat of a powerful chemico-biological activity by which the mangolds are able to profit; they leave therefore to the next crop, which is generally wheat, smaller quantities of fertilizing principles and especially of nitrogen; it is therefore necessary to make up the deficiency by abundant manuring of the maize when combined with mangolds or by applying a quick acting fertilizer to the wheat.

That there is no danger of the mangolds dying during the suspension of growth has been ascertained by the writer even in the case of its combination with Caragua giant maize, as well as in southern districts with dry summers and in light mellow volcanic soils.

The combination allows for compensation for the damage which in some years drought causes to the maize, for the reduced growth of the maize allows the mangolds to grow larger.

Lastly, the writer gives the appropriate cultural rules:—The soil to be sown should be crumbled; the space between the lines of maize should not exceed or but slightly that of maize grown by itself e.g., for early Reggio drawf maize, it should measure 16 to 20 inches; no special attention is necessary for the associated crops; weeding and earthing up are done at the same time; the uprooting and transplanting of the mangolds causes no injury to the maize.

Sugar beet is much less suitable for growing with maize; whatever variety is grown the roots can only be used for feeding cattle; it is therefore better to grow mangolds in combination with maize as they give a more abundant crop.

1155.—Study on the Pollen of Fruit Trees.—Casella, D., (*Cattedra di Arboricoltura della R. Scuola Sup. di Agricoltura in Portici*) pp. 24, bibliography of 46 publications. Cosenza, 1922.

In fruit trees imperfect setting of the flowers is due to numerous causes. The writer has undertaken its study, selecting among anemophilous trees the vine and the mulberry and among entomophilous trees the Rosaceae such as the apple, pear, peach, apricot, almond and plum.

The writer refers to and confirms certain opinions already maintained and adds some personal observations. Firstly he examines the influence of meteorological conditions. A light wind helps pollinization because it transports the pollen of anemophilous plants without scattering. Moreover, by favouring evaporation, it accelerates dehiscence; finally by shaking the flowers it facilitates the opening of the anther. On the other hand a strong wind scatters the pollen and blows away the insects which assist in pollinization; it may also break off the flowers and break the branches. Hail has a similar injurious effect. Rain washes away the pollen and makes it burst and germinate prematurely in the anthers; it causes browning and necrosis of the stigma; makes transport of the pollen by wind impossible; washes away the sugary excretions which attract insects, keeps the insects away and prevents them from feeding on the flowers. In the vine during rain, the hood adheres to the stigma and obstructs the anther; in the Rosaceae the stamens adhere to the style; if the stamens are longer than the style, the stigma remains immersed in the water and comes off; if, later, the water evaporates, the stamens regain their normal position and the anthers dehisce, but meanwhile the germinative power of the grains of pollen which have burst or germinated has diminished. Mist is just as injurious as rain; its moisture causes partial bursting and premature germination of the pollen and necrosis of the stigma; pollinization is specially hindered by a thick mist, which deposits a film of water and sometimes small drops. Light and solar heat accelerate all vital functions and consequently pollinization; moreover they have an indirect action inasmuch as they cause the secretion of nectar and the production of colours and scents which attract insects; they also stimulate the insects themselves. A high temperature accelerates the germination, the bursting of the pollen grains and the elongation of the pollen tubes. On the other hand, low temperatures retard the dehiscence of the anthers, hinder the germination of the pollen and prolong the duration of the elongation of the pollen tube.

The writer has made numerous observations on pollen and ascertained that not only does the pollen vary in different species but also in certain cases in different varieties and that, in certain varieties of fruit trees, the pollen from the same anther has various forms and dimensions and a different percentage of grains which contain no protoplasmic substance.

The writer undertook numerous tests on the germination of pollen. With this object

he tried to use little drops of liquid taken from the stigma of the almond and difficult to collect, as well as the juice of the plum, pure water, moist air, etc. He found that the best was a solution of saccharose in the proportion of 10 per cent (apple) 15 per cent (pear), 20 per cent (almond). He often found abnormal teratologic forms of which he gives a description. The pollen grains of the vine always emit a bubble which persists at the insertion of the pollen tube and keeps it inflated.

The writer has studied germinative power in various conditions. It remained constant for each variety of fruit tree. Pollen from diseased plants are relatively more sterile. The influence of temperature was greater; the optimum temperature was 59°F. for the almond, 68°F. for the vine. Fungicidal and insecticidal preparations were almost all decidedly injurious. The writer also tested the effect of these preparations on the setting of vine-flowers; he painted them on the stigmas with a brush. All the preparations were injurious. Sulphur, to which some persons attribute a beneficial action on setting, was also injurious, and it is probable that the beneficial action attributed to the sulphur is due to the dissemination of the pollen helped by the movement of the air and of the cluster at the time of applying the sulphur. Water proved injurious, it intensified the harmful effects of the fungicides and insecticides on the germinative power. The use of such substances should be regulated so as to obtain the advantages which are desired from them, without njury to production.

1162.—Influence of the Weight of the Potato Set on the Crop.—SALAMAN, R.N., in *The Journal of Agricultural Science*, Vol. XII, 2nd Part, pp. 182-196. London, April 1922.

Experiments carried out at Barley (Herts, England) with potatoes of the Barley Bounty variety grown on well-tilled vegetable mould, without farmyard manure but which had been manured with superphosphate + sulphate of ammonia + kainit. The results may be summed up as follows: The total crop is directly proportional to the weight of the sets. The use, as sets, of tubers weighing less than 1 ounce, gave a large return and a good proportion of marketable tubers (that is to say not too small), but such sets do not give the greatest yield. If the total weight of the sets, the proportion of good tubers and the total crop, are considered, the best sets are those of tubers weighing about 2 ounces each. Portions of tubers consisting of secondary tubers gave much more abundant crops than any other kind of set; slightly smaller crops were obtained by using as sets whole tubers bearing secondary tubers; both also gave equally a large proportion of marketable tubers. There is an inverse relation between the size of the sets and the percentage of large tubers in the crop. A large production of secondary tubers and a large proportion of heavy tubers in the crop may be connected with want of maturity of the sets. There is no relation between the quantity of secondary tubers among the sets and the quantity of secondary tubers in the crop raised from such sets.

LIVE STOCK AND BREEDING

840.—A Disease of Young Pigs Consequent on Dry Years.—MOUSSU, G., in *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VIII, No. 18, pp. 534-541. Paris, May 17, 1922.

Study of the osseous cachexy of young pigs aged 2 to 5 months. Clinically, the disease is characterized by the following stages:—

(1) Stopping of growth and difficulty in walking (period of the disease called the squalor period);

(2) articular deformation and walking on the knees (gout period);

(3) deformations of the skeleton and of the head;

(4) final decay, the sick animals die of starvation.

The first stage only lends itself to therapeutic intervention, in any case of doubtful value.

This disease may break out any year and occurs chiefly in certain regions (Aube, Marne, Yonne, etc.), but consequent on dry years, it spreads a little everywhere, except where the pigs are regularly run on pasture. A ration given at too early a stage, composed of a large proportion of farinaceous matter, without dairy refuse, vegetables, roots and green fodder, favours the disease. Up to date, no micro-organism capable of reproducing the disease has been isolated, but the writer has shown, a long time ago, that it may be reproduced experimentally by direct contagion and by starting with emulsions of the diseased osseous marrow.

Treatment recommended by the writer:—1 gramme of chloral per day per 10 kg. of live weight, in the rations, as anodyne to the painful condition and as general antiseptic; sometimes hydrochlorate of ammonia as a stimulant to nutrition; salts of lime (phosphates, bi-phosphates, carbonates, chloride of calcium, etc.) to facilitate the osseous recalcification.

1076.—The Identification of Cattle by Means of Nose-Prints.—PETERSON, W.E., in *Journal of Dairy Science*, Vol. 5, No. 3, pp. 249-258. Baltimore, May, 1922.

The various breeding associations have always been confronted with a serious problem in the proper identification of

animals for registration and of animals on official test. All other means having proved unsatisfactory, O. H. Baker, of the American Jersey Cattle Club, suggested using nose-prints for the purpose. The author describes the method of taking the prints and the best way of identifying the prints so obtained. The most satisfactory results were given by mimeograph newsprint paper and black stamping-pad ink. From different tests made with some 350 cattle the author drew the following conclusions: (1) no two animals have identical pattern nose-prints, therefore these prints will enable positive identification; (2) the taking of nose-prints is simple enough to be practical; (3) it is possible to identify prints as being of the same animal, even if they are not perfect; (4) the pattern remains the same through life; (5) this test is practical for the identification of cows on official test and may prove valuable in connection with the registration of all solid colour cattle; (6) the method affords a positive means of identification when claim for loss is made under live stock insurance policies.

851.—Butter-Fat Percentage of Cow's Milk Increased for Two Days by Partial Milking.—REGAN, W. M. and MEAD, S. W., in *Journal of Dairy Science*, Vol. IV, No. 6, pp. 495-509. Baltimore, November, 1921.

In the supervision of advanced registry tests, it is required that cows be milked dry at the milking preceding the test period. This entails considerable loss of time and expense and the question has arisen as to the necessity for the operation.

The author carried out some experiments with Holstein, Jersey, and Ayrshire cows. The animals were milked dry twice daily for 6 days; on the 7th day only half the milk was drawn, and during the 4 subsequent milkings, the cows were again milked dry.

Samples were taken at each milking and tested for butter-fat. It was found possible to increase the percentage of butter-fat in milk during a period of 2 days by leaving half the milk in the udder during the milking prior to the two-day period. Although the average increase in butter-fat was only 0·27 per cent the data collected seem to show that it is possible to obtain an increase of over 0·5 per cent by leaving a certain amount of milk in the udder, but if too much is left, the contrary effect is produced. The highest fat percentage was not always reached at the milking following the partial milking; it was only attained in 12 out of the 27 trials. As there was an average increase of only 0·766 lb. of milk for the two days following the partial milking, the practice of leaving part of the milk in the udder could not be detected by a study of the cow's milk record.

The data collected in this experiment show that a preliminary milking is necessary as a measure for safe-guarding the accuracy of advanced registry testing.

1084.—Insulating Capacity of Double-Walled Bee Hives.—PHILLIPS, E. F., in *United States Department of Agriculture, Department Circular 222*, 10 pp. Washington, May, 1922.

The great number of double-walled bee-hives on the market, where they find ready purchasers among beekeepers by whom they are largely used, has given rise to considerable discussion as to their comparative merits. In order to decide the question, the author carried out a series of experiments and obtained the following information:

The shape of the hive has a considerable influence upon its insulating power, and therefore upon its capacity for preventing loss of heat and protecting the bees from winter cold. The heat escapes most readily from the bottom and the insulation of the walls and top is never so complete as to prevent a large amount of heat from being dissipated.

Beekeepers however never trouble about the insulation of the bottom of the hive, as they are under the impression that the heat escapes through the top. It is a mistake to uncover the front of the hive, even if it faces south, for if any part of the hive is left with only a single wall, or without some other means of protection, all the efforts made to keep the rest of the hive warm are to a great extent nullified.

In the double-walled hives on the market the heat escapes so readily from the bottom, that little is lost through the roof and still less through the walls.

An air-space left between the two walls does not retain the heat as well as a layer of some material that is a bad conductor, especially if the interstices are very small. Convection currents which dissipate the heat are doubtless always present in the dead angles of the cavity of the hive. The board forming the ceiling should extend as far as the external wall upon which the roof rests. It is more effective to close the double wall only, than merely to shut the opening of the hive.

A thicker layer of insulating material should be used than is generally the case. If sawdust is used, the layer ought to be 4 to 6 inches thick.

FARM ENGINEERING

867.—Electricity and Agriculture.—MATTHEWS, R. B., in *Journal of the Royal Society of Arts*, Vol. LXX, No. 3620, pp. 367-368. London, April 7, 1922.

The problem of increasing the yield from the numerous small holdings in England and Wales has directed attention to the possibilities of use of electricity on the farm in districts where it is difficult to use gas and coal for machinery, etc.

The author points out the economic advantages to be derived from electric lighting for cow sheds, the improvement in cleanliness, reduction in waste of milk, cattle food, etc., by providing adequate light in habitually darkened buildings. In addition the electric motor can be readily utilized for machine work, for chopping cattle food, working churns, milk separators, etc. Such motors are easily handled and require a minimum of labour. The fact that hay can be dried artificially by means of electrically driven fans gives the farmer more control over his crops and makes him more independent of the weather. Successful results with electric heating for the prevention of frost amongst stores of roots and vegetables have been reported and also for drying fruits in bottling factories, etc. The use of electric heat has also already proved its value for incubation purposes and has given an increased yield of eggs at a time of year when they are of the highest market value. There are undoubtedly great possibilities in its application to milk sterilization and ensilage purposes.

Recent experiments on a practical scale have demonstrated that an extremely small amount of electrical power converted in a suitable apparatus to a very high tension and discharged from overhead wires strung across the fields has a remarkable effect upon most forms of vegetable life, increasing yield and in many cases advancing the period of harvest. Although it is at least possible that the effect may be rather in the nature of a stimulant than a food, and due to some effect upon the plant which improves its power of absorbing and assimilating nutriment from suitable soil, there is already sufficient evidence to justify careful and continued research in this direction.

AGRICULTURAL INDUSTRIES

1225.—The Milking Machine and the Hygienic Qualities of Milk.— Brew, J.D., in *The Journal of Dairy Science*, Vol. V, No. 4, pp. 412-420. Baltimore, July 1922.

The "New York City Board of Health" has laid down that first quality milk, that is to say milk sold raw for direct consumption, must not contain more than 30,000 micro-organisms (colonies) per cubic centimetre; milk which is sterilized must not contain more than 100,000 if of second quality or more than 300,000 if it is third quality. Beyond these limits milk is considered unfit for direct consumption. The three qualities above referred to are designated respectively by the letters A, B, C.

To encourage the production of hygienic milk the sellers pay the producers a premium on first quality milk and a much smaller one on second quality milk. It is therefore of great interest to the producer to know the rules to be followed to produce hygienic milk.

In March 1921 the Dairy Department of New York State College of Agriculture, undertook a propaganda and instruction campaign for the production of hygienic milk. The work was based on bacteriological study, by means of the direct microscopic method, of milk delivered by every producer to retailers on 2 or 3 successive days; the results so obtained were explained and discussed at a meeting of producers to whom previous notice was given. The examination of milk carried out in this way from March to September has enabled important information to be collected on the subject of the principal bacterial factors which affect the number of bacteria in milk. Observations made in classifying 3243 samples of milk delivered by 1104 producers have led to the conclusion that the most common causes of a large number of bacteria in milk when it is delivered to the seller in town are: (1) want of rapid and effective chilling of the milk immediately after milking; (2) high contamination of the milk by jugs or other dairy utensils which were not sufficiently sterilized by means of a jet of steam, boiling water or by drying in a current of hot air immediately after washing; (3) heavy contamination by dirty milking machines.

The comparative examination of milk supplied by 790 producers, 635 of whom milked by machine and 155 by hand, has enabled it to be ascertained that:—before the meeting of producers 31·6 per cent of those who used milking machines supplied A. quality milk, 12·9 per cent milk of B. quality and 55·5 per cent C. quality milk; after the meeting, 54·0—18·5—27·5 respectively; those who milked by hand: —before the meeting A. quality milk 70·7—B. quality 9·3—C. quality 20·0 per cent; after the meeting 84·6—5·9—9·5 per cent respectively.

These results, from a hygienic point of view, are not in favour of milking machines; on the other hand they indicate the possibility of improving present conditions, which is much to be desired, since, owing to the high cost of manual labour, milking machines are becoming more and more common.

One of the main reasons for insufficient cleaning of milking machines is that the manufacturing firms, in the instructions for the use of their machines, do not sufficiently emphasize the necessity of careful cleaning. To eliminate these drawbacks the representatives of various factories met at a conference at which the question was explained to them and they will try to find a solution.

1228.—Common Defects in Butter and How to Avoid Them.—HAMILTON, D., in *Bulletin No. 427, Department of Agriculture, Salisbury, Rhodesia,* 11 pp. Salisbury, August, 1922.

The most common defects in butter, so far as flavour is concerned, are as follows:—insipidity—flavour of burnt meat—flavour of fish—flavour of cheese—flavour of yeast—bitterness—mouldiness—rancidity. The writer (Dairy Expert, Specialist for Dairy and Milk Food Industries to the Department of Agriculture of Rhodesia), describes them in detail, examines their causes and shows how to avoid them; finally, he gives the following summary of the precautions to be taken in making butter.

The place where butter is made should be cool, hygienic, clean; the walls should be frequently whitewashed. The receptacles intended for holding cream should only be used for that purpose and should be suitable. The cows should get succulent green food, even in winter. The cream should be kept in as cool a place as possible in summer and at a temperature of 60°F. in winter; very low temperatures cause the development of a bitter taste in the cream. Churning should be done at least every three days in summer and every four days in winter.

Churning should not take too long, as in that case the butter loses its consistency. The butter should be washed twice while still granular, with water as cold as possible. Butter should not be kept in a damp, dark place. Butter should not be worked up to such a degree as to make it soft. Granular butter should be turned out on the working up table, covered with damp muslin and well drained. If the butter is too much worked up, it has the texture of lard. For salting, use a saturated solution of salt; this hardens the granules of butter and helps to give a good texture. If salt is used in solid form it must be very pure, thoroughly pounded and evenly distributed. The pats of butter should be nicely shaped and wrapped in good butter-paper. Boxes for packing butter should be divided into compartments, each able to contain one pound. It is preferable to use a shallow box with a wide bottom holding 2 layers of pats, rather than a box with a narrower bottom containing 5 or 6 layers.

Regarding the causes of defects in butter, the writer explains them in the following manner:—

Insipidity.—This is one of the most common defects. It is due to various causes, but mainly to lack of green forage, to preservation of the cream, to too low a temperature while ripening and to excessive washing of granular butter.

Flavour of fat.—This flavour is ordinarily due to excessive ripening of the cream.

Flavour of cheese.—Is due to the decomposition of proteins in the buttermilk left in the butter owing to insufficient washing.

Flavour of yeast.—Due to keeping the cream too long before churning, or to insufficient cleaning of the cream separator. To avoid it, the cream should be refrigerated as soon as it is collected and should be quite clean.

Bitterness.—This has often been noticed during the dry season when the cows are obliged to eat tough grass, but the most frequent cause is the presence of impurities in the salt.

Mouldiness.—Is due to the growth of mould in the cream; to avoid it the receptacles should be thoroughly cleaned, and the cream should be covered with muslin while being kept and when sent to be churned.

Rancidity.—Is due to being kept at insufficiently low temperatures; it occurs especially in defective butter. Well made butter keeps very well, as is proved by an experiment made in New Zealand. Some butter made from pasteurized cream, well churned and washed, was sent to London and kept there in a refrigerator for 10 years; at the end of that time it was still perfectly sound.

PLANT DISEASES

1109. The Ascomycete Ophiobolus Cariceti, as the Cause of Take-All of Cereals and Grasses.—FITZPATRICK, H. M., THOMAS, H. E., and KIRBY, R. S., in *Mycologia,* Vol. XIV, No. 1, pp. 30-37. Lancaster, Pa., 1922.

In July 1920, perithecia of a species of *Ophiobolus* were observed at East Rochester, (New York) on wheat plants showing characteristic symptoms of the take-all disease, subsequently reported in various localities in the state and also elsewhere.

The fungus has been obtained in pure culture and repeated inoculations have shown it to be a specific agent of this disease.

This fungus, after comparative experiments made with material from America, England, Italy, France, Japan and Australia, has been classified as *O. cariceti* (Berk and Br.) Sacc.

A complete diagnosis of the parasite is given.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

Problems of Cotton Growing.—CORTESI, Dr. F., in *International Review of the Science and Practice of Agriculture*, August 1922, pp. 927-938.

805.—Researches on the Efficacy of Deep Tillage and on the Distribution of the Roots of Certain Plants in Different Strata of Soil.—AVANZI, E., in *L'Agricultura Italiana*, Year XLV, parts 1-3, pp. 41-56. Pisa, 1922.

842.—The Insufficiency of Lime and Phosphoric Acid in the Feeding of Animals.—GOUIN, R., in *Revue de Zootechnie*, No. 6, pp. 526-534. Paris, March 15, 1922.

858.—The Effect of Food Upon the Fat Content of Goats' Milk.—SHEEY, E. J., in *The Scientific Proceedings of the Royal Dublin Society*, Vol. XVI, Nos. 35-39. pp. 478-488, bibliography of 11 works. Dublin, 1922.

864.—Egg-Laying Characteristics of the Hen.—DRYDEN, J., in *Oregon Agricultural College Experiment Station, Bulletin* 180, pp. 1-96. Corvallis, Oregon, August 1921.

899.—The Agricultural Problem of the South of Italy and Its Dependence on Biological Conditions.—V. RIVERA, in *Atti della Societa Agronomica Italiana*, Years II and III, No. 2, pp. 27-73. Rome, June 30, 1922.

911.—Soil Acidity and Bacterial Activity.—STEPHENSON, R. E., in *Soil Science*, Vol. 12, No. 2, pp. 133-144 and 145-162, bibliography of 13 works. Baltimore, August, 1921.

933.—Potassium Nitrate Ratio of Red Clover as Influenced by Potassic Fertilizers.—EMERSON, P., and BARTON, J., in *Journal of the American Society of Agronomy*, Vol. 14, No. 5, pp. 182-192, bibliography of 17 works. Geneva, N.Y., May, 1922

951.—Smooth-Awned Barleys.—HAYES, H. K., and WILCOX, A. N., in *Journal of the American Society of Agronomy*, Vol. 14, No. 4, pp. 113-117, bibliography of 9 works. Geneva, N.Y., April 15, 1922.

955.—Sunflower Growing in Rhodesia.—MAINWARING, C., in Bulletin No. 423, *Department of Agriculture, Salisbury, Rhodesia*, pp. 8. June, 1922.

962.—The Duration of the Contagious Period in Foot-and-Mouth Disease.—LEBAIL, C., in *Comptes rendus de l'Academie des Sciences*, Vol. 174, No. 24, pp. 1580-1582. Paris, June 1922.

966.—Quantitative Botanical Analysis of Artificial Stock Feeds.—AZENDAM, JOH. A., in *Verslagen van Landbouwkundige onderzoekingen, der Rykslandbouwproefstations*, No. XXV, pp. 1-83. Gravenhage, 1921.

996.—Researches on "Incappucciamento," a Disease of the Red Clover.—MANZONI, L., in *Le Stazioni sperimentali agrarie italiane*, Vol. LV, Parts 4-6, pp. 130-144. Modena, 1922.

Cocoa Growing in the State of Bahia (Brazil).—DR. J. W. de ARANJO PINHO, in *International Review on the Science and Practice of Agriculture*, October, 1922, pp. 1169-1181.

1013.—Plant Indicators of Soil Types.—KELLEY, A. P., in *Soil Science*, Vol. XIII, No 6, pp. 411-423. New Brunswick, N.J., June 1922.

1015.—Factors Influencing the Determination of Sulphate in Soil.—HIRST, C. T., and GREAVES, J. E., in *Soil Science*, Vol. XIII, No. 4, pp. 231-239. New Brunswick, N.J., April 1922.

1018.—The Influence of Moisture and Soluble Salts on the Bacterial Activities of the Soil.—GREAVES, J. E., and CARTER, E. G., in *Soil Science*, No. 4, pp. 251-270. New Brunswick, N.J., April 1922.

1021.—Effect of Tree Products on the Bacterial Activities in Soil; Ammonification and Nitrification.—GIBBS, W. M., and WERKMAN, C. H., in *Soil Science*, Vol. XIII, No. 4, pp. 303-322. New Brunswick, N.J., April 1922.

1027.—Assimilability of Various Phosphate Manures.—VON WRANGELL, M., in *Landwirtschaftliche Jahrbucher*, Vol. LVII, No. 1, pp. 1-77. Berlin, March 1922.

1028.—The Supply of Nitrogen for Agriculture in Germany.—WIRTSCHAFT UND STATISTIK, Year 11, No. 3, pp. 72-73. Berlin, February 1922.

1031.—Seeds and Plants Introduced by the Agricultural Department of the United States.—*Inventory of Seeds and Plants imported by the Office of Foreign Seed and Plant Introduction during the Periods from January 1 to March 31, 1917; April 1 to June 30, 1917; July 1 to September 1917;* No. 30, 83 pp.; No. 51, 100 pp.; No. 52, 55 pp. Washington, 1922.

1047.—Is the Transplantation of Maize Advantageous?—MORETTINI, A., in

L'Italia agricola, Year 50, No. 8, pp. 259-263. Piacenza, August 1922.

1050.—Action of Various Manures on Beans. —VAN HAUTEN, A., in *Journal fur Landwirtschaft*, Vol. 70, No. 1, pp. 1-7. Berlin, July, 1922.

1071.—Experimental Contributions to the Knowledge of the "Working Conditions" of Draught Animals Under Different Dietary Conditions.—ALBERTONI, L., in *Le Stazioni sperimentali agrarie italiane*, Vol. LV, No. 4-5-6, bibliography of 46 publications. Modena, 1922.

1077.—Studies on Reproduction of Cattle.—I. GRAU, A., in *Revue de Zootechnie*, No. 9, pp. 869-880. Paris, June 15, 1922.-II. MACCANDLISH, A. C., Studies in the Growth and Nutrition of Dairy Calves, in *Journal of Dairy Science*, Vol. V, No. 3, pp. 301 321. Baltimore, May 1922.

1081.—The Goat as an Economic Factor.—CREPIN, J., in *Le Lait*, Year II, No. 5, pp. 313-320. Lyons, May 1922.

1103.—The Clarification of Unfermented Fruit Juices.—CALDWELL, J. S., in *United States Department of Agriculture, Bulletin* No. 1025, pp. 1-30, bibliography of 35 works. Washington, January 23, 1922.

1105.—Studies on the Biology of Lactic Acid Bacteria.—GORINI, C., in *Journal of Bacteriology*, Vol. VII, No. 2, pp. 271-276. Baltimore, March 1922.

1110.—Observations Made in New York State on the Take-All Disease of Cereals and Grasses (Ophiobolus Cariceti).—KIRBY, R. S., in *Phytopathology*, Vol. XII, No. 2, pp. 66-68. bibliography of 31 works. Lancaster, Pa., 1922

AGRICULTURAL STATISTICS

THE WORLD'S WHEAT 1922-23 AND 1923-24

By T. K. Doherty

To what extent will the supplies of the past season 1922-23 be absorbed by the closing of the grain year? What are the prospects of wheat production for the present season and what are the prospects of supply and demand for the grain year 1923-24?

The following statistics, the basis of which is the May number of the "Statistical Bulletin" of the International Institute of Agriculture," are answers to these questions and need very little comment.

In the matter of areas sown to wheat and wheat production, official data are not yet available for a certain number of countries. For these, estimates are made, based on the most reliable official and unofficial information.

Earlier reports gave the statistics for Europe as particularly favourable, and there seems now justification for assuming that there will be a per acre yield during the present season in general equal to that of the good crop reaped in 1921. We have acted on this assumption for nearly all the countries of Europe except where, in a few cases, reliable correspondents indicate important deterioration for various causes Thus, from France comes the news, through the "Corn Trade News" of June 5th, "that persistent rain and heavy falls of hail have caused the crops to lose the advantage they obtained from favourable seeding. Prospective yields are diminishing." Rust has also occurred to some extent. Then it must be remembered that the area sown to wheat in France this year is still 2,500,000 acres less than before the war and with average conditions cannot be expected to reach the average production of that period, namely 320,000,000 bushels. From Spain "the latest mail advices state that crop prospects are very favourable in the provinces of Castile and Extremedura, but in Aragon and Navarre a comparatively poor crop is anticipated." From New South Wales it is stated that "rain is mentioned in two districts only, so we fear that droughty conditions must still prevail over the greater part of this State." Droughty conditions are also said to exist in southern Italy. This recent news has somewhat modified the very optimistic earlier reports from these four countries.

Nineteen countries whose wheat represents on an average 60 per cent of the total world's harvest officially report an aggregate area of 168,031,000 acres compared with 169,290,000 last year and the average 1917-1921 of 164,431,000. From this official statement the majority of European countries report slight decreases for the current year, but France reports an increase of one million acres, which leaves a net increase for the Continent of about 700,000 acres.

In this article, for the purpose of getting at the practical results for the current year, derived chiefly from the official reports but, in their absence, also from private estimates, we present the following statement of the areas sown to wheat and the world's total wheat production:

World's Production of Wheat

Countries	Area 1923	Area 1922	Area 1921	Production 1923	Production 1922	Production 1921
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Europe:—						
Great Britain and Ireland	2,000,000	2,073,000	2,076,000	70,000,000	64,000,000	73,795,000
France	13,660,000 (a)	12,702,000	13,300,000	312,000,000	243,243,000	323,470,000
Germany	3,200,000	3,396,000	3,562,000	97,000,000	71,934,000	107,824,000
Belgium	328,000 (a)	337,000	341,000	13,800,000	10,615,000	14,495,000
Netherlands	160,000	156,000	180,000	8,000,000	5,236,000	8,425,000
Denmark	235,000	237,000	220,000	11,200,000	9,370,000	11,145,000
Norway	41,000	41,000	41,000	970,000	643,000	972,000
Sweden	360,000	356,000	360,000	12,500,000	9,381,000	12,577,000
Finland	22,000 (a)	22,000	20,000	280,000	296,000	280,000
Spain	10,379,000 (a)	10,309,000	10,386,000	142,000,000	125,470,000	145,151,000
Portugal				10,000,000	9,782,000	9,418,000
Italy	11,614,000 (a)	11,491,000	11,779,000	180,000,000	160,570,000	192,838,000
Switzerland	160,000	152,000	173,000	5,000,000	3,571,000	5,284,000
Luxemburg	40,000 (a)	42,000	45,000	660,000	500,000	661,000
Poland	2,324,000 (a)	2,574,000	2,095,000	42,000,000	42,451,000	37,410,000
Czechoslovakia	1,483,000 (a)	1,526,000	1,556,000	37,000,000	33,621,000	38,382,000
Austria	450,000	454,000	379,000	7,700,000	7,150,000	6,530,000
Hungary	2,900,000	2,855,000	2,888,000	53,000,000	45,074,000	52,716,000
Jugoslavia	3,602,000 (a)	3,723,000	3,824,000	49,000,000	42,248,000	51,810,000
Roumania	6,150,000	6,547,000	6,149,000	80,000,000	92,008,000	78,564,000
Bulgaria	2,259,000 (a)	2,226,000	2,361,000	39,000,000	37,705,000	42,510,000
Greece	900,000	890,000	988,000	10,000,000	9,553,000	11,170,000
Total Europe	62,267,000	62,109,000	62,724,000	1,181,110,000	1,024,421,000	1,225,427,000
(a) Official figures						
North America:						
Canada	22,165,000 (a)	22,423,000	23,261,000	340,000,000	399,786,000	300,858,000
United States	58,253,000 (a)	61,230,000	63,696,000	817,000,000	856,211,000	814,905,000
Total North America	80,418,000	83,653,000	86,857,000	1,157,000,000	1,255,997,000	1,115,763,000
Asia:—						
India	30,550,000 (a)	28,635,000	25,783,000	401,000,000	366,351,000	250,356,000
Japan	1,199,000 (a)	1,229,000	1,264,000	25,000,000	27,615,000	26,921,000
Total Asia	31,749,000	29,864,000	27,047,000	426,000,000	393,966,000	277,277,000
Africa:—						
Algeria	3,049,000 (a)	3,103,000	2,816,000	30,000,000	18,233,000	33,764,000
Egypt	1,500,000	1,518,000	1,458,000	37,000,000	36,648,000	37,011,000
Morocco	2,350,000 (a)	2,068,000	1,790,000	23,000,000	12,894,000	23,220,000
Tunis	1,112,000 (a)	882,000	1,500,000	10,000,000	3,674,000	10,623,000
South Africa	850,000	839,000	867,000	7,000,000	6,696,000	8,689,000
Total Africa	8,861,000	8,410,000	8,431,000	107,000,000	78,145,000	113,307,000
South America:						
Argentina	16,500,000	16,081,000	13,927,000	200,000,000	194,070,000	180,642,000
Chili	1,300,000	1,285,000	1,296,000	23,000,000	23,420,000	22,179,000
Uruguay	500,000	493,000	812,000	8,000,000	3,674,000	9,944,000
Total South America	18,300,000	17,859,000	16,035,000	231,000,000	221,164,000	212,765,000
Australasia:—						
Australia	9,000,000	9,800,000	9,719,000	100,000,000	108,811,000	132,285,000
New Zealand	300,000	285,000	353,000	8,000,000	8,500,000	10,565,000
Total Australasia	9,300,000	10,085,000	10,072,000	108,000,000	117,311,000	142,850,000
World's Total	210,895,000	211,980,000	211,166,000	3,210,110,000	3,091,004,000	3,087,389,000

(a) Official estimates.

Taking into consideration, therefore, all the twenty two countries of Europe, exclusive of Russia, there is to be noted a marked steadiness of areas under wheat which, for the years 1921, 1922 and 1923 (estimated) range about 62,000,000 acres On the basis previously explained assuming a yield equal to the exceptionally good yield of 1921, with the figures slightly shaded for France, Spain and Italy there is a promise of production for Europe 156,000,000 bushels in excess of last year's, but about 45,000,000 bushels less than the production of 1921

On the other hand, Canada and the United States, the chief supply countries of the Northern Hemisphere, exhibit a decrease in area of over 3,000,000 acres, chiefly accounted for in the United States and, as compared with last years' crop, a decreased production of nearly 100 000,000 bushels and, as compared with the crop of 1921, an increase of about 41,000,000 bushels There is compensation for this in the Southern Hemisphere where there is an important increase of nearly 2,000,000 acres in India, with a crop already officially reported at 401,000,000 bushels, and in Argentina an increase for the forthcoming season roughly estimated at 500,000 acres, with a correspondingly increased prospective production

There results from all the details of the foregoing table a world's total area of 210,895,000 acres compared with 211,980,000 last year, a decrease of a little over 1,000,000 acres and a total world's production of 3 210,110,000 bushels, compared with 3,091, 004,000, an increase of 119,100,000 bushels

MOVEMENT OF WHEAT IN 1922 23

What has been the movement of wheat during the present year which is to end on August 1st next? The official reports show up to March 31st net exports of the amount of about 489,000,000 bushels Assuming exports continue at the same rate—and the exports have been well sustained during the last three months in preceding years there would be, up to August 1st, a further export of about 230,000,000 bushels and an annual total of 720,000,000 bushels Making, from the exporter's viewpoint, a fairly generous estimate for the concluding months not yet officially reported, the total net exports of wheat and flour from the chief exporting countries will stand on August 1st as follows

Canada	276 000 000 bushels
United States	213 000 000 "
India	21 000 000 "
Australia	52 000 000 "
Argentina	147 000 000 "
Total	709 000 000 "

Again, on June 5th, Mr Broomhall renewed his estimate of the importers' needs at 696,000,000 bushels with 574,000,000 bushels shipped and 122,000,000 bushels still to be received At the end of May Canada had exported 236,000,000 bushels and the United States estimating the May shipments as equal to those of April were in the same period only 185,000,000 bushels, from which should be deducted the imports from Canada We estimate United States shipments for the remaining two months at 30,000,000 bushels The Indian shipments will be heavier for the last four months averaging possibly 3,000,000 bushels a month, Australia's lighter with an average of about 5 000 000, while Argentina's shipments will continue heavy for the last three months unreported at about 17,000 000 bushels per month These estimated shipments for the balance of the grain year amount to 153,000,000 bushels and would bring the total to 709,000,000 as above shown And it is quite possible if the European harvest is a week or ten days late that the figure will reach 720,000,000

United States grain writers expect a large unexported surplus on August 1st next The last United States wheat crop may be briefly analyzed as follows

		Bushels
Crop of 1922		856 000 000
Deduct 5 per cent for cleaning waste and unmerchantable wheat		42 000 000
Total merchantable wheat		814 000 000
Add carry-over Aug 1 1922		61 000 000
Total for distribution		875 000 000
Food for 110 000 000 at an average of 5 bushels per capita	550 000 000	
Seed for 58 000 000 acres	87 000 000	
		637 000 000
Balance available for export		238 000 000
Exported approximately		213 000 000
Carry over on August 1 1923		25 000 000

The corresponding showing for Canada follows

1922 crop	399 786 000
Less for cleaning and unmerchantable wheat	21 793 000
Balance	377 993 000
Add carry-over of Aug 30 1922	30 000 000
Total available for distribution	407 993 000
Deduct food and seed	92 000 000
Total available for export	315 993 000
Estimated exports to August 1st next	276 000 000
Probable carry over August next	40 000 000

On the incoming of the new crop September 1st the unexported balance of the old crop is estimated at 20,000,000 bushels This is assuming that the 1922 crop has not been overestimated, as is claimed by some of the best Western crop experts In our opinion the unexported surplus will be less than that shown by the above calculation

Taking a world wide view we can see no indication that on August 1st next there will

remain unexported from the 1922 crop an abnormal surplus of wheat. The average in the exporting countries is likely to be about normal, while the importing countries' stocks are small and need replenishing.

PROSPECTS FOR 1923-24

What are the prospects for the grain year 1923-24?

The world's exports for the good European crop year 1921 were about 648,000,000 bushels and the total exports for the forthcoming grain year will probably not be less but rather larger. It is likely that Europe's production, as shown by the preceding table, will be 45,000,000 bushels under that of the record year of 1921. There are already evidences of general economic and financial recovery in many important countries of Europe, and this movement once begun is likely to continue to increase Europe's general credit and incline her people to be more generous with their food. Their own good crops are increasing their credit for further purchases. If the indications are not for the unusually large imports of the past year, there is a likelihood that there will be a market for practically all the exportable surpluses. These exports might be estimated as follows:—

	Bushels
United States	175,000,000
Canada	250,000,000
Argentina	120,000,000
Australia	40,000,000
India	40,000,000
Balkans	15,000,000
Russia	15,000,000
Other sources	10,000,000
Total	665,000,000

The average world exports of wheat, for the pre-war years 1909-1914, amounted to 664,000,000 bushels. There is little likelihood of a glutted market during the forthcoming grain year, but rather of a production closely approximating requirements and which would fall short of requirements should adverse weather develop in any important wheat region. The producer can therefore face the future with confident hope.

There is some probability that Russia will re-enter the market, although on a small scale. It will be of interest to note what the "Corn Trade News" of June 5th says of the Russian situation:

"Of the Russian crop, very little news has recently been received, but as seasonable and favourable weather has prevailed in the Balkans, it is very likely that good conditions have also prevailed in Southern Russia, where a big part of the wheat crop is grown. It will be prudent not to depend on Russia for a great deal of wheat, but if the Soviet Government decide that exports must be made, we expect they will make extraordinary efforts to collect the needful material. When Russia re-enters the market as an exporter of sizeable quantities, the chances are that the event will have far reaching effects on the international trade. In this connection we have just received a letter from an Englishman abroad who in pre-war days frequently visited South Russia specially to make himself acquainted with crop conditions there. He says: I consider it as quite impossible that any such surplus as 140 million bushels mentioned recently in Chicago reports will be available this coming season, even the Soviets do not claim that the area under cereals approaches the pre-war figure. No doubt rye is now perfectly safe and will go far toward satisfying the internal food requirements, but wheat, chiefly spring sown, has much yet to face. I should say that an export of 16,000,000 bushels from August 1923 to July 1924 is as good a guess as can be made at present."

AREAS SOWN TO RYE, BARLEY AND OATS

RYE

Countries	1923	1922	Average 1917 to 1921
	Acres	Acres	Acres
Belgium	475,000	531,000	535,000
Bulgaria	457,000	442,000	476,000
Spain	1,755,000	1,757,000	1,803,000
Jugoslavia	388,000	369,000	404,000
Finland	578,000	578,000	596,000
France	2,172,000	2,087,000	2,019,000
Italy	321,000	321,000	316,000
Latvia	618,000	592,000	523,000
Lithuania	1,385,000	1,369,000	1,196,000
Luxemburg	21,000	21,000	20,000
Poland	11,325,000	11,159,000	8,795,000
Roumania	456,000	481,000	666,000
Czechoslovakia	2,127,000	2,160,000	2,211,000
Canada	2,046,000	2,105,000	782,000
United States	5,234,000	6,210,000	5,130,000
Totals	29.358.000	30.182.000	25.472.000

BARLEY

Countries	1923	1922	Average 191[illegible] to 1921
	Acres	Acres	Acres
Belgium	82 000	63 000	7[illegible] 000
Bulgaria	531 000	534 000	553 000
Spain	4 151 000	4 082 000	4 225 000
Jugoslavia	488 000	484 000	549 000
France	1 59[illegible] 000	1 427 000	1 613 000
Italy	568 000	5[illegible]7 000	530 000
Roumania	166 000	259 000	137 000
Czechoslovakia	1 686 000	1 686 000	1 650 000
Japan	2 518 000	2 746 000	2 912 000
Canada	2 556 000	2 600 000	2 [illegible]08 000
United States	[illegible]980 000	7 390 000	8 017 000
Algeria	2 [illegible]81 000	868 000	2 729 000
Morocco	2 802 000	2 548 000	2 246 000
Tunis	988 000	603 000	1 1[illegible]3 000
Totals	28 869 000	27 867 000	29 151 000

OATS

Countries	1923	1922	Average 191[illegible] to 1921
	Acres	Acres	Acres
Bulgaria	344 000	[illegible]2 000	3[illegible]6 000
Spain	1 509 000	1 514 000	1 533 000
Jugoslavia	[illegible]0 000	103 000	
France	8 540 000	[illegible]905 000	7 [illegible] 000
Italy	1 211 000	1 214 000	1 184 000
Czechoslovakia	[illegible]938 000	[illegible]031 000	1 9[illegible] 000
Canada	14 110 000	14 541 000	15 [illegible] 000
United States	40 [illegible]68 000	40 [illegible]3 000	43 116 000
Algeria	588 000	583 000	9[illegible] 000
Morocco	32 000	8 000	14 000
Tunis	1[illegible]1 000	112 000	152 000
Total	6[illegible] 000	[illegible] 000	[illegible] 000

FOREIGN CROP CONDITIONS

(June 22nd 1923)

Conditions in April—In many parts of Western Europe the cold weather of early April delayed growth of the winter crops to some extent, but later in the month improvement set in and at the beginning of May, the crops were almost everywhere reported in satisfactory condition. At that time the European crop condition varied from average to good and was generally more promising than at the beginning of April and quite decidedly better than at the same time last year. Spring sowings were somewhat hindered by unfavourable weather, but, where completed, looked well.

Conditions generally in May—According to the International Institute of Agriculture all European crops were in general good condition on June 1st.

United Kingdom—During the second half of May cold, rainy weather was experienced. Winter wheat appeared to be the best crop but was in need of sunshine. In a general way the condition of both winter and spring crops on June 1st was indicative of average yield. According to the Institute the area sown to winter wheat is slightly less than last year.

France—In the latter part of May there were heavy rains and rust had made its appearance in some areas. On June 1st prospects for the winter crops were described as satisfactory. Spring crops needed warmth and sunshine. The area sown to winter wheat is about 1,000,000 acres larger than last year. The latest report on June 5th, indicates that cereal growth has been checked by cold, wet weather. There have also been frequent hailstorms.

Germany—At the end of May the weather had turned cold, but crop prospects were well maintained. Spring sown crops were doing well. The area sown to winter wheat was expected to be slightly less than last year.

Portugal.—Prospects are for a remarkably good harvest. Reports indicate the best crops in fifteen years.

Spain.—Early reports were very favourable, but latest reports indicate only a fair outturn of wheat, a short crop in some districts being forecasted.

Italy.—Following recent rains in the latter part of May, cereal growth made rapid progress. According to the later reports, however, the outlook is not so favourable. Drought in the South and hail damage in Northern districts are reported.

Austria.—Growth was rather backward owing to excessive rains. A decrease in acreage is reported.

Hungary.—On June 1st the outlook was excellent and wheat and rye were reported above average condition. Later reports indicate that the eastern part of the country has suffered from drought.

Czechoslovakia.—An official report describes the condition of wheat and barley as good and that of rye and oats as average.

Poland.—The condition of winter crops on May 1st was above average.

Jugoslavia.—On May 14th the wheat crop was reported as satisfactory. Later good rains were reported.

Bulgaria.—On June 1st all crops were reported to be in excellent condition.

Roumania.—The area sown to winter wheat is 500,000 acres less than last year, but the condition of the crops is very satisfactory. On June 1st prevailing weather conditions were all that could be desired.

Russia.—An increase in the winter wheat acreage is reported, and a considerable one is expected in spring sowings.

North Africa.—According to reports received at the end of May, weather conditions were very favourable. Prospects in Algeria were described as excellent, while in Tunis the yield of wheat and barley is forecasted as 20 per cent above average.

India.—Threshing was carried out under satisfactory conditions. The first estimate of the wheat crop of 1923 was 425,000,000 bushels compared with 366,000,000 last year. A later estimate gives this year's production as 401,000,000 bushels.

Japan.—The latest report received from the Institute states that the weather in April was unfavourable

Argentina.—Weather conditions were favourable for seeding. Broomhall's correspondent reports that an all-round increase in the acreage of wheat, oats and flaxseed is expected as a result of the good weather conditions and the heavy influx of foreign labour. The corn crop is estimated as 156,000,000 bushels against 230,000,000 last year and a five years' average of 175,000,000 bushels.

Australia—Following the injurious drought there were good rains in May and the crop outlook improved. Prospects are described as favourable in Western and South Australia, Victoria and part of New South Wales. Elsewhere rain is required.

SUGAR PRODUCING SEASON 1922-23

BEET SUGAR—PRODUCTION OF RAW SUGAR

Countries	Production from the opening of the season (Sept. 1 to April 30)			Total yield during the season 1921-22
	1922-23	1921-22	Percentage (1921-22=100)	
	Short tons	Short tons	Per cent	Short tons
Germany (1)	1,564,263	1,393,258	112·3	1,429,284
Austria (2)	26,856	18,036	148·9	18,036
Belgium (1)	292,274	315,112	92·8	315,497
Bulgaria (2)	18,210	14,238	127·9	14,238
Denmark (2)	98,987	155,757	63·6	155,757
Finland (3)	1,746	2,244	77·8	2,244
France (1)	541,359	333,810	162·2	402,990
Hungary (4)	87,720	66,646	131·6	67,097
Italy (4)	284,158	222,880	127·5	227,514
Netherlands (1)	256,178	380,463	67·3	381,910
Poland (3)	355,278			200,588
Sweden (2) ..	79,186	258,792	30·6	258,792
Czechoslovakia .	808,272	727,425	111·1	730,305
United States (2)	785,226	1,159,644	67·7	1,159,644

(1) Yield to the end of March. (2) Total yield. (3) Yield to the end of January.
(4) Yield to the end of February.

CANE SUGAR—TOTAL YIELD OF RAW SUGAR

Countries	1922 23	1921 22	Percentage 1922 23 (1921 22 = 100)
	Short tons	Short tons	Per cent
Argentina		212 747	
Brazil		910 959	
Cuba		4 476 791	
United States	241 336	324 431	74 4
Nicaragua	12 677	14 881	85 2
Peru		341 717	
Porto Rico	392 782	405 936	96 8
Dominican Republic		205 974	
Formosa	372 053	368 041	101 1
India	3 346 560	2 910 880	115 0
Java	1 986 042	1 858 610	106 9
Egypt (1)	103 134	111 785	92 3
Mauritius	258 720	224 660	115 2
South Africa	157 960	146 987	107 5
Australia	342 640	336 477	101 8
Hawaii		592 000	

(1) Yield to the end of April

INDEX NUMBERS OF THE PRICE OF WHEAT

Dates		EXPORTING MARKETS			
		Canada WINNIPEG	*United States* CHICAGO	*India* KARACHI	*Argentina* BUENOS AIRES
		No 1 Manitoba	No 2 Winter	Karachi white	Barletta
Average	1913	100	100	100	100
9 May		106 0	101 9	102 9	104 6
12	1922	167 9	160 9	178 8	155 5
2 March	1923	126 3	132 7	127 3	138 7
9		126 0	133 0	128 1	137 0
16		128 7	134 5	128 9	137 6
23		130 3	135 7	133 0	138 2
29		130 1	133 1	131 2	137 0
6 April		133 5	136 4	131 4	138 7
13		138 8	140 2	135 9	141 0
20 "		138 1	140 4	136 7	140 5
27		135 6	141 3	137 5	141 6
4 May		135 4	134 6	137 5	140 5
11		132 7	132 7	133 0	137 6

Dates	IMPORTING MARKETS					
	Germany BERLIN	*Belgium* ANTWERP	*France* PARIS	*Great Britain* LONDON	*Italy* MILAN	*Netherlands* ROTTERDAM
	Home grown	Home grown	Home grown	Home grown	Home grown soft	Home grown
Average 1913	100	100	100	100	100	100
9 May "	107	104 6	104 6	101 0	10[illegible]	104 6
12 " 1922	7 245	338 4	281 0	16[illegible] 7	595 0	137 8
2 March 1923	452 466	404 0	337 1	119 8	395 0	101 0
9 " "	350 788	404 0	342 0	118 7	398 6	99 8
16 " "	391 459	419 2	332 1	119 8	402 1	105 2
23 " "	399 085	383 8	325 9	116 7	402 1	109 3
29 " "	421 962	378 8	n q	118 7	402 1	114 1
6 April "	503 305	404 0	326 8	118 7	400 4	
13 " "	518 556	409 1	325 0	121 9	400 4	122 8
20 " "	594 814	429 3	329 4	132 3	403 9	127 1
27 " "	630,402	429 3	329 0	133 [illegible]	403 9	126 0
4 May "	747 331	434 3	334 8	131 4	407 5	122 3
11 " "	762 583	429 3	340 2	132 3	407 5	120 4

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

Products, Markets and Descriptions	4 May 1923	6 April 1923	5 May 1922	Aver. 1913
WHEAT (*cents per 60 lbs.*)				
Canada:				
Winnipeg: No. 1 Manitoba	117	115	142	88
United States:				
Chicago: No. 2 Winter	121$\frac{1}{2}$	123$\frac{3}{8}$	141$\frac{1}{4}$	90$\frac{3}{4}$
Minneapolis: No. 1 North	126	126	158	87$\frac{7}{8}$
New York: No. 2 Winter	136$\frac{1}{2}$	136$\frac{3}{4}$	153$\frac{1}{2}$	97$\frac{1}{4}$
India:				
Karachi: Karachi white	120	115	142	91
Argentina:				
Buenos Aires: Barletta	120	120	133	100
Germany:				
Berlin: Home grown	56	127	138	128
Belgium:				
Antwerp: Home grown	134	122	145	104
France:				
Paris: Home grown	169	162	197	146
Great Britain:				
London: English	133	119	159	104
Liv. and Lond.: No. 1 Man	142	136	167	110
Liv. and Lond.: No. 2 Win	141	n.q.	143	109
Liv. and Lond.: Pacific	151	142	157	111
" " Plate	140	135	155	108
" " Australian	151	152	160	117
" " C.W. Kar.	145	111	n.q.	110
Italy:				
Milan: Home grown soft	153	152	162	118
Netherlands:				
Rotterdam: Home grown	137	138	151	115
RYE (*cents per 56 lbs.*)				
United States:				
Minneapolis: No. 2	76$\frac{1}{2}$	78	103	56$\frac{3}{4}$
Germany:				
Berlin: Home grown	44	103	94	101
Belgium:				
Antwerp: Home grown	99	96	119	80
France:				
Paris: Home grown	n.q.	115	118	97
Netherlands:				
Rotterdam: Home grown	100	101	127	86

Ocean Rates of Freight, and Voyages	4 May 1923	6 April 1923	5 May 1922	Aver. 1913
OCEAN RATES OF FREIGHT (WHEAT AND MAIZE) (*cents per 100 lbs.*)				
Rumania:				
Danube to U.K.	22	18	17	11
Danube to Genoa	20	17	15	10
Canada:				
Canada to U.K.	16	17	16	14
United States:				
New York to Liverpool	8	11	9	10
North Range to U.K. Cont.	14	16	16	13
North. Range to Genoa	18	21	20	20
North Pacific Ports to U.K.	39	39	37	43
Argentina:				
Plate Down River-U.K.	35	24	26	18
Plate Up River-U.K.	37	25	30	20
India:				
Karachi to U.K.	30	30	19	20
Rangoon to U.K.	34	35	26	29
Australia:				
Australia to U.K.	37	40	46	34
COTTON FREIGHTS (*cents per 100 lbs.*)				
United States:				
New York to Liverpool	20	20	25	30
New Orl. to Liverpool	n.q.	n.q.	50	43

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 10: No. 5 September-October, 1923

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA

MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS.

CONTENTS

PART I

DOMINION DEPARTMENT OF AGRICULTURE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

PART III

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS. PUBLICATIONS AND NOTES

PART V

THE INTERNATIONAL INSTITUTE OF AGRICULTURE

The AGRICULTURAL GAZETTE
OF CANADA

VOL. X SEPTEMBER-OCTOBER, 1923 No. 5

A REVIEW OF THE CANADIAN DAIRY INDUSTRY

General Survey

DAIRYING, one of the most important of Canadian agricultural industries as well as one of the oldest, began its development in its modern form with the introduction of the centralized or factory system of making cheese and butter, the centrifugal cream separator, and improved cold storage facilities. The first Canadian cheese factory was established in the province of Ontario in 1864, the first butter factory, in the province of Quebec, in 1873. The year 1882 witnessed the introduction of the first cream separator from Denmark, while the government organization of cold storage services dates from 1895. The factory system, a semi-co-operative plan for the manufacture of milk, immediately became popular, and for many years practically all the cheese has been manufactured on this plan. While the output of butter factories or creameries is great and is continually increasing, 68 per cent of the total quantity of butter produced was, according to the Census of 1911, made on the farms, either for home consumption or for near-by markets.

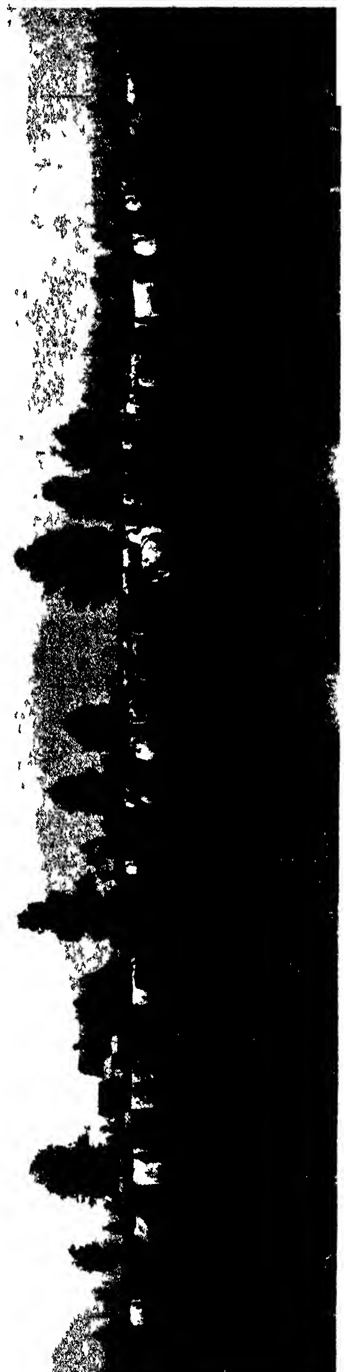
The factory system of manufacture is common to all the provinces of Canada, but the older provinces, Ontario and Quebec, with their greater population, lead all others in the volume of output, these two provinces producing approximately 97 per cent of the total cheese and 68 per cent of the total creamery butter.

Recent Developments

Three important changes have taken place in the Canadian dairy industry of recent years. These are a decrease in the production of factory cheese from 220,833,269 pounds in 1900 to 134,530,053 pounds in 1922, an increase in creamery butter production from 36,066,739 pounds in 1900 to 146,863,517 pounds in 1922, and an increase in condensed milk products, which in the period, 1900-1922, have grown in value from $269,520 to $6,839,232.

In the provinces of Manitoba, Saskatchewan and Alberta the dairy industry has developed since 1910 in a remarkable manner, the output of creamery butter having increased from 4,161,947 pounds, valued at $459,254 in 1910, to 28,619,641 pounds, valued at $10,348,762 in 1921. A further increase in 1922 over 1921 is recorded, as follows: Manitoba, 23·5 per cent, Saskatchewan, 25 per cent, and Alberta, 20 per cent.

During this period, these provinces, from importers have become exporters of butter to the Eastern Canada markets and to British Columbia. The quality of the product due to efficient control is at least equal to that produced in any other part of the Dominion, and has secured a good reception in the British market in competition with that of other countries.



Dairy Farm and Ayrshire Herd at Sardis British Columbia

Increased production has coincided with the number of cows kept, and with the establishment of creameries. The number of cows in the three provinces in 1910 was 427,671, compared with 1,100,288 in 1922, and creameries are now accessible generally.

In Canadian factories the cheese manufactured is mostly of the Cheddar type. Genuine Stilton is turned out on the Dominion Experimental Farm at Agassiz, B.C., and a soft cheese, known as Meilleur, has been originated at the Central Experimental Farm, Ottawa. The Trappist monks at the Oka Agricultural Institute in Quebec make what is known as Oka cheese. Cottage cheese is made to a limited extent on the farm from sour skim-milk without the aid of rennet.

OUTPUT AND VALUE

An estimate of the total value of the dairy products of Canada, made for the year 1921 by the Dominion Dairy Commissioner and the Dominion Bureau of Statistics, placed it at $212,896,350. The details as to quantities and values are as follows:—

Dairy Production, 1921

Product		Quantity	Value
Cheese	Lbs.	162,117,494	$ 28,710,030
Creamery butter	"	128,744,610	48,135,439
Farm butter	"	125,000,000	37,500,000
Whey butter	"	1,357,404	431,114
Condensed milk	"	38,997,936	5,837,787
Condensed skim-milk	"	1,307,781	51,788
Evaporated milk	"	31,202,713	3,428,456
Condensed coffee and cocoa	"	324,011	94,065
Milk powder	"	1,703,496	554,918
Skim-milk powder	"	5,749,229	830,585
Sterilized milk	"	6,696,264	719,009
Casein	"	98,136	9,814
Ice cream	Gals.	5,736,702	8,287,000
Cream sold by dairy factories	Lbs. B. fat	8,051,215	5,734,638
Buttermilk sold			300,278
Milk for direct consumption			72,000,000
Curd, cheese, whey, whey cream, skim-milk			271,429
Total value			$212,896,350

In the foregoing statement the quantity of butter produced on farms, and designated "Farm Butter," is estimated.

The total value of the products of Canadian dairy factories, omitting farm-made butter, etc., for the years 1911, 1917, 1920, 1921, follows:—

Value of All Dairy Factory Products, 1911-21

1911	$ 39,047,840
1917	93,879,326
1920	146,336,491
1921	111,924,017

Creamery Butter

The total quantity of creamery butter produced in Canada in 1922 was 146,863,517 pounds (preliminary figures) compared with 128,744,610 in 1921. The production of creamery butter has increased about two and a half times during the last twelve years in Ontario and Quebec. In the Western Provinces, the production, while relatively small, has increased at an even greater ratio.

QUANTITY AND VALUE OF CREAMERY BUTTER, BY PROVINCES, 1920, 1921 AND 1922

Province	1920		1921		1922
	Quantity	Value	Quantity	Value	Quantity
	lbs.	$	lbs.	$	lbs.
Prince Edward Island	1,166,032	674,744	1,109,546	452,523	1,274,622
Nova Scotia	2,503,188	1,518,757	3,094,768	1,306,465	3,296,566
New Brunswick	1,053,649	606,891	1,152,168	475,112	1,218,969
Quebec	41,632,511	23,580,949	48,478,403	17,594,921	52,529,344
Ontario	37,234,998	21,343,858	43,471,532	16,680,247	51,000,000
Manitoba	7,578,549	4,282,731	8,541,095	3,253,057	10,559,601
Saskatchewan	6,638,656	3,727,140	7,030,053	2,552,698	8,891,450
Alberta	11,821,291	6,555,509	13,048,493	4,543,007	15,175,300
British Columbia	2,062,844	1,334,624	2,818,552	1,277,409	2,917,665
Totals	111,691,718	63,625,203	128,744,610	48,135,439	146,863,517

Cheese

The quantity of cheese made on the farms is negligible. The total quantity of factory cheese produced in 1922 was 134,530,053 pounds (preliminary figures). These figures show a decrease of 27,587,441 pounds over 1921. Five provinces showed an increase and four a decrease. The increases were as follows: Prince Edward Island, 484,189 pounds; Nova Scotia, 2,420 pounds; Quebec, 3,106,707 pounds; Alberta, 547,346 pounds; and British Columbia, 21,840 pounds. The decreases were: New Brunswick, 181,866 pounds; Ontario, 6,759,066 pounds; Manitoba, 30,829 pounds; and Saskatchewan, 2,659 pounds.

The following table shows, by provinces, the production and value of factory cheese for the years 1920 and 1921, and the production for 1922.

QUANTITY AND VALUE OF FACTORY CHEESE, BY PROVINCES, 1920, 1921 AND 1922

Province	1920		1921		1922
	Quantity	Value	Quantity	Value	Quantity
	lbs.	$	lbs.	$	lbs.
Prince Edward Island	2,081,277	525,635	1,681,779	293,651	1,742,242
Nova Scotia	52,638	14,865	29,440	5,578	31,860
New Brunswick	1,235,008	336,409	1,100,382	203,941	918,496
Quebec	52,162,777	13,372,250	54,242,735	9,197,911	39,679,901
Ontario	92,784,757	24,605,823	103,432,696	18,676,380	90,500,000
Manitoba	116,229	31,611	255,829	47,341	225,000
Saskatchewan	28,367	7,790	22,659	4,209	20,000
Alberta	398,750	110,355	930,660	200,478	975,000
British Columbia	342,053	96,134	421,314	80,541	437,554
Totals	149,201,856	39,100,872	162,117,494	28,710,030	134,530,053

Condensed Products

During the last twenty years the manufacture of condensed and dried milk has become well established, particularly in Western Ontario, while the manufacture of ice cream is now an important industry in all parts of Canada.

The first milk-condensing plant was established in Truro, Nova Scotia, in 1883. There are in Canada at the present time, 23 plants engaged in the manufacture of condensed or evaporated products, including milk powder and sterilized milk. The output of these products was valued in 1900 at $269,520, in 1921 at $11,526,422, and in 1922 at $6,839,232.

Powdered Milk

The manufacture in Canada of milk powder by modern spray processes dates from 1909, although the hot roller process was in operation commercially several years earlier. At the present time there are ten produc-

ing plants engaged for the most part in the manufacture of skim-milk powder. Other kinds of powder are, however, manufactured to a considerable extent, including whole milk and cream powders, as well as modified milk powder, protein milk powder, and ice cream powder. It is estimated that, in 1923, upwards of 100,000,000 pounds of milk will be marketed in the form of powders of various kinds

The following tables give the production and value of condensed and miscellaneous dairy products for the years 1920 and 1921:—

CONDENSED PRODUCTS 1920 AND 1921

Product	1920		1921	
	Quantity	Value	Quantity	Value
	lbs	$	lbs	$
Condensed milk	53 662 699	10 202,230	38 997 936	5 837,787
Condensed skim-milk	363 294	18 723	1 307 781	51 788
Evaporated milk	30 469 642	3 809 653	31 202 713	3 428 456
Milk powder	7,574,668	2,178,176	1 703 496	554,918
Skim milk powder			5 749 229	830 585
Sterilized milk	7,608 927	785,044	6 696 264	719 009
Condensed coffee and cocoa	531 451	147,052	324 011	94 065
Casein	109,958	19,233	98 136	9 814
Totals		17 160 111		11 526 422

MISCELLANEOUS PRODUCTS 1920 AND 1921

Product	1920		1921	
	Quantity	Value	Quantity	Value
	lbs	$	lbs	$
Whey butter	1 516 932	757,156	1 357,404	431 114
Ice cream	2 996 514	4 151 949	3 007 337	3 967 918
Milk sold	28 199 796	14 249 858	27 003 785	12 846 749
Cream sold (lb butter fat)	7 379 131	6 533 098	8 051 215	5 734 638
Buttermilk sold		306 235		300 278
Sundry		452 009		271 429
Totals		26 450 305		23 552 126

Increase in Production

That the volume of production of the dairy industry in Canada is steadily increasing, is indicated by the following statement of the annual factory output over a period of years:

CREAMERY BUTTER PRODUCTION
Quantity

	Pounds
1911	64,698 165
1916	82 564,130
1920	111,691,718
1921	128 744,610
1922	146,863,517

FACTORY CHEESE PRODUCTION
Quantity

	Pounds
1911	199,904,205
1916	192,968,597
1920	149,201,856
1921	162,117,494
1922	134,530,053

The diversion of milk from cheese factories to condensed milk and milk powder factories and increased demand from growing urban population for milk, cream, butter, and ice cream, have resulted in the cheese output declining or remaining stationary.

MISCELLANEOUS PRODUCTS
Value
CONDENSED AND EVAPORATED MILK CREAM ICE CREAM, AND WHOLE MILK ETC

1911	$ 1 814 871
1917	18 424 485
1920	43 610 416
1921	35 699 581

Further evidence of increased production is found in the number of dairy cows kept on Canadian farms:

NUMBER OF DAIRY COWS

1911	2 595 255
1916	2,835 532
1920	3 530 238
1921	3,736 832

It is estimated that the average yield of milk per year of milk cows in the Dominion is about 4,000 pounds.

The 'Canadian' Cow—a breed originated in Canada. The herd at the Oka Agricultural Institute, La Trappe, Quebec.

DOMESTIC CONSUMPTION

AVERAGE PER CAPITA CONSUMPTION OF DAIRY PRODUCTS IN CANADA, THE UNITED STATES AND THE UNITED KINGDOM

Country	Year	Milk	Butter	Cheese
		gallons	lbs.	lbs.
Canada	1916	26 0	27 7 (1911)	3·0 (1911)
United States	1920	43 0	15 5 (1919)	4 2 (1919)
United Kingdom	1914	22 2	17 0 (1914)	11·2 (1905)

MANUFACTURE—CHARACTER OF DAIRY FACTORY ORGANIZATION

Of the total factories in operation in 1921, 2,177 were operated by individuals and partnerships, 478 by incorporated companies and 459 by co-operative associations.

The classification as to the number of days operated in the year is as follows:—

Number of factories operating for 240 days and over	817
Number operating for 180 to 239 days.	1,154
Number operating for 120 to 179 days	1,046
Number operating for less time .	97

Capital Employed in Dairy Factories

The total amount of capital employed by dairy factories in 1921 was $35 257,831, the following being the allocation:—

Land and buildings	$ 13 655,472
Machinery and equipment	13,096 066
Products on hand	4 012,059
Cash and operating accounts	4 494,234
Total	$ 35,257 831

Number of Dairy Factories and Patrons

In 1921 there were 3,114 dairy factories in operation. Of these, 1,092 were creameries, 1,619 cheese factories, 376 combined butter and cheese factories, and 27 were condenseries. While the total number of factories showed a decrease as compared with 1919 and 1920, the number of farmers supplying milk and cream increased, being 312,369 in 1921 compared with 276,693 in 1920 and 275,060 in 1919.

NUMBER OF ESTABLISHMENTS AND AMOUNT INVESTED IN DAIRY FACTORIES, BY PROVINCES, 1921

Provinces	Establishments	Capital Invested
	No.	$
Prince Edward Island ...	34	167,381
Nova Scotia	24	436,636
New Brunswick	38	302,922
Quebec	1,766	7,048,603
Ontario	1,062	18,191,626
Manitoba	51	2,338,647
Saskatchewan	56	2,592,319
Alberta	50	2,536,781
British Columbia	28	1,077,150
Total	3,114	35,257,831

Milk and Cream Delivered and Amount Paid Patrons

The quantity of milk delivered to factories in 1921 was 2,965,222,121 pounds, and the quantity of cream was 88,263,208 pounds (butter fat content), increases being shown in both products over the previous year. The amount paid to patrons for milk and cream in 1921 was $81,422,226. The average price for milk was $1.57 per 100 pounds, and the average price for cream per pound (butter fat content) was 39 cents.

Number of Cows

The number of cows supplying milk to factories was 1,851,199 in 1921, compared with 1,718,999 in 1920.

MARKETS AND MARKETING—EXPORTS AND IMPORTS

The United Kingdom is Canada's chief export market for dairy products. It may be said indeed to be the only export market of primary importance. Canada's cheese has long held, and continues to hold, a premier position in that market. As regards butter, the export surplus is too irregular at present to establish its position securely, although prospects for expansion are distinctly encouraging.

The exports of all dairy products show an increase in volume during the last ten years, except cheese, which slightly decreased. The most important increase has been in condensed and preserved milk, and, more recently, in the butter exports.

In the butter-making industry, the present rate of increase in exports (3,142,682 pounds in 1911 and 21,994,578 pounds in 1923) is expected to be maintained, in view of the establishment of government grading, the organization of the business in Western Canada and the possibilities for extension existing in that part of the country and elsewhere.

Cheese

Of the cheese exported, practically the whole finds its way to the United Kingdom, where it is well known to the British consumer. The export business in cheese grew rapidly from 1870 to 1900. In later years the increase has not been so marked on account of increased domestic demand for dairy products.

CHEESE EXPORTS AND IMPORTS, CANADA 1911-23

Exports			Imports		
Year	Quantity	Value	Year	Quantity	Value
	lbs.	$		lbs.	$
1911	181,895,724	20,739,507	1911	866,653	171,269
1916	168,961,583	26,690,500	1916	971,821	187,873
1920	126,395,777	36,356,863	1920	362,693	206,500
1921	133,620,300	37,146,722	1921	551,040	253,647
1922	133,849,800	25,440,322	1922	877,357	325,297
1923	114,548,900	20,828,234	1923	916,517	327,022

Butter

Butter is exported to various countries; the excess of exports over imports has become great only during the last fiscal year. In the fiscal year of 1922-23 the total amount exported was 21,994,578 pounds, the excess of exports over imports being 18,227,005 pounds. The destination of the exports was varied, 17,527,607 pounds going to the United Kingdom; 2,423,086 pounds to the United States; and various small amounts to Belgium, Bermuda, British Guiana, British West Indies, China, Cuba, Newfoundland and other countries.

The butter exports and imports of recent years are as follows:—

BUTTER EXPORTS AND IMPORTS, CANADA, 1911-23

Exports			Imports		
Year	Quantity	Value	Year	Quantity	Value
	lbs.	$		lbs.	$
1911	3,142,682	744,288	1911	1,227,390	296,303
1916	3,441,183	1,018,769	1916	4,309,831	1,092,800
1920	17,612,605	9,844,359	1920	397,955	176,994
1921	9,739,414	5,128,831	1921	3,741,628	1,805,709
1922	8,430,591	3,224,390	1922	6,078,882	1,883,013
1923	21,994,578	8,243,138	1923	3,767,573	1,349,819

Other Products

Condensed and preserved milk was exported in 1923 principally to the United Kingdom (9,949,600 pounds); United States (5,822,600 pounds); British West Indies (1,756,300 pounds); Belgium (148,200 pounds); Cuba (1,515,700 pounds); Netherlands (4,126,000 pounds); Newfoundland (546,800 pounds); Germany (388,900 pounds); and to numerous other countries in various small amounts.

Exports of milk powder, fiscal year 1923, total 3,927,952 pounds; to United Kingdom 1,229,888 pounds; to United States 1,475,816 pounds; to Germany 1,136,238 pounds.

EXPORTS AND IMPORTS OF MILK AND MILK PRODUCTS, 1916-23

	Year	Imports		Exports	
		Quantity	Value $	Quantity gals	Value $
Cream	1916			1,262,280	1,131,832
	1920			795,780	1 122 424
	1921			1,279,195	1 987 461
	1922			1,671,678	2 479,080
	1923			1,712,241	2,793,937
Milk, fresh	1916			394 831	59,028
	1920			1,985 113	576,666
	1921			1,508,618	412,916
	1922			1,391,299	311,922
	1923			856,039	189,301
Milk and Cream, fresh	1916		13,914		
	1920		18,652		
	1921		45 973		
	1922		33 055		
	1923		28,274		
				lbs	
Milk powder (formerly included in next following item)	1922			909 208	204 090
	1923			3,927,952	383,855
Milk, condensed, canned or preserved					
		lbs.			
(includes milk powder prior to 1922)	1916	53,258	3,987	13,247,800	770,566
	1920	75 652	10,730	54,247,500	8,517,771
	1921	131,026	21 215	49,147,500	8,187,937
	1922	164,654	27,219	33 133,500	4 881 020
	1923	209,606	46 [illegible]87	26,381,200	2,861,058
Casein	1916		24,372	50,564	3,282
	1920	1,234 635	159 177		..
	1921	1,04[illegible],713	129 017		
	1922	217,613	19 689	23,615	1,413
	1923	643,347	92,710	20,060	1,281

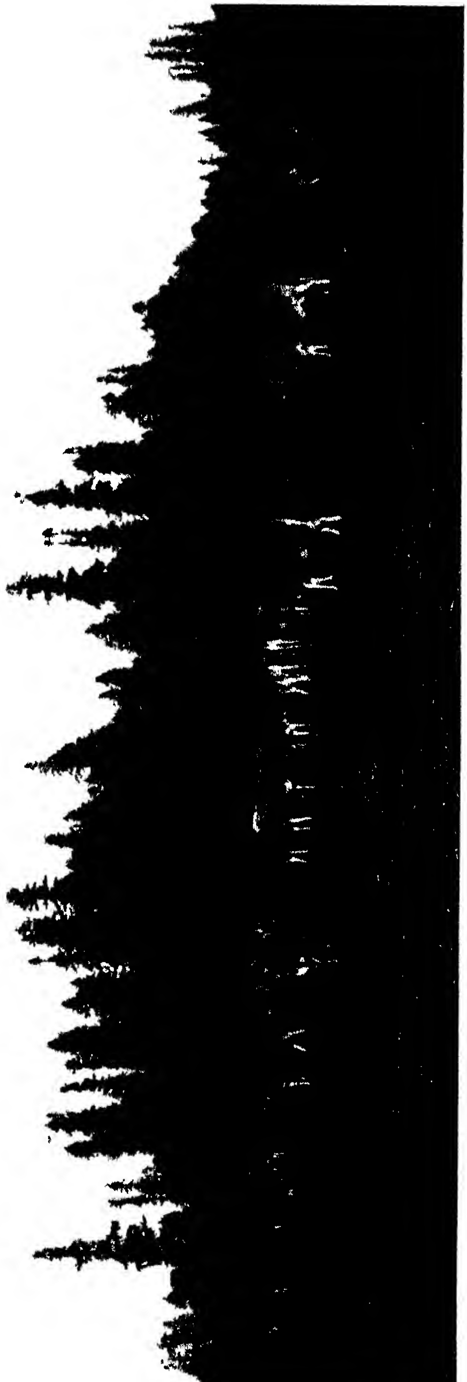
Export Facilities

The butter and cheese destined for overseas markets is exported chiefly through the port of Montreal during the season that navigation is open, and, during the winter months, from St. John, N.B. A new and completely equipped cold storage warehouse of large capacity has recently been erected at Montreal by the Harbour Board. The plant is located on the harbour front and is accessible by all the railways entering Montreal.

Most of the steamers in the regular trade with the United Kingdom are now equipped with cold storage facilities.

Oleomargarine and Renovated Butter Prohibited

In 1917, the entry of oleomargarine and its manufacture and sale in Canada was permitted as a war measure. By a recent decision of Parliament, its import and manufacture after September 1, 1923, and its sale after March 1, 1924, was again prohibited. The importation, manufacture and sale of renovated butter and of "filled" milk or cream (that is milk or cream containing fat other than that of milk) is prohibited.



Jersey Cows in Pasture Comox District British Columbia

Exports via Montreal

The total exports of butter and cheese from Montreal for the years 1910 to 1922, inclusive, were as follows:—

	Cheese boxes	Butter pks (Average of 56 lbs.)
1910	1,892,235	27,884
1915	1,851,731	54,495
1920	1,407,548	10,357
1921	1,441,779	70,369
1922	1,166,147	318,144

GOVERNMENT REGULATION AND SUPERVISION

Government regulation and supervision of the dairy industry and its development, from the Federal point of view, is in the hands of the Dairy and Cold Storage Branch of the Dominion Department of Agriculture, Ottawa, with a commissioner at its head, who administers all Federal dairy enactments. The grading of dairy produce is under the control of this Branch. Among its other important functions are: (1) Cargo inspection both at Canadian ports and in the United Kingdom. By means of this service defects in handling, packing and shipping, and temperatures during transit are reported. (2) The inspection of public cold storage warehouses; (3) The granting of subsidies to cold storages; (4) The issuing of market reports; (5) The encouragement of cow testing by owners of dairy herds; (6) The conducting of educational Butter and Cheese Scoring Contests, under which samples of the output from all parts of Canada are scored and reported upon to the makers, with a view to establishing a uniformly high standard, and (7) the operating of a model demonstration factory. The education of the public as to the nutritive value of milk and milk products, particularly in the diet of the young, has recently been undertaken by the Branch.

Under government auspices associations have been very generally established in all the provinces for testing the production of individual cows in the dairy herd. A progressive increase in milk and fat production has followed, as the following figures indicate:—

AVERAGE PRODUCTION IN TESTED DAIRY HERDS	1915	1919	1921
Average production, milk, lbs	5,285	5,522	5,801
Average production, fat, lbs.	195 5	207·9	214 1

The number of cows under test was 1919, 22,517; 1920, 33,382; 1921, 47,895 (exclusive of Saskatchewan).

The work of the dairy schools of the different provinces and the employment of inspector-instructors who visit the factories from time to time, have resulted in greater uniformity in the quality and character of the cheese and creamery butter produced in widely separated parts of the country, while the various activities of the Dominion Department of Agriculture in disseminating dairy information, in correlating the provincial educational work, in providing refrigerator car services, and encouraging the insulation of cold storage space on trans-atlantic steamers, have helped materially to place Canadian dairy produce on the markets of the United Kingdom and other countries in the best possible condition.

Dairy Produce Grading

The government grading of all creamery butter and factory cheese intended for export, according to established standards, was inaugurated on April 1, 1923. Previous to that time, export cheese, sold by auction at Montreal, had been graded, while several of the provinces had, for a number of years, undertaken more or less educational grading both of cheese and butter. With the grading

and classification of all export dairy products, buyers abroad may absolutely rely on these products conforming to standard.

The government grading of cream at the creamery was recently instituted, under provincial auspices, in each of three Prairie Provinces, Manitoba, Saskatchewan and Alberta, and also in Nova Scotia. The extension of this system to other provinces is looked for.

Inspection of Condensed Products

Establishments in which milk is condensed, evaporated or otherwise preserved for food for export, either out of Canada or out of any province to any other province thereof, are inspected under the Meat and Canned Foods Act by officers of the Dominion Department of Agriculture. Regulations thereunder provide that the materials used shall be sound and wholesome, that containers shall be properly sterilized, that no deleterious drug, dye or preservative may be used, and that the label shall show the name and address of the manufacturer and give a true description of the contents.

Dominion Experimental Farms

The work of the Dominion Experimental Farm System in relation to dairy husbandry is both extensive and varied. Comparisons are conducted in the grading up of dairy herds, and feeding studies are carried on. These investigations extend to many of the branch farms in all sections of the Dominion. Several different kinds of cheese are manufactured, including a soft cheese known as Meilleur, which was originated at the Central Farm, Ottawa.

The following is a list of the Farms and Stations belonging to the Dominion Experimental Farms System which maintain pure-bred herds of dairy cattle, together with the name of the breed:—

Province	Station	Breed
Prince Edward Island	Charlottetown	Ayrshire
Nova Scotia	Kentville	Shorthorn
	Nappan	Guernsey
New Brunswick	Fredericton	Holstein, Ayrshire
Quebec	Lennoxville	Ayrshire, Jersey, Shorth on
	Cap Rouge	French-Canadian
	Ste Anne de la Pocatière	Ayrshire
	La Ferme	Ayrshire
Ontario	Cental Experimental Farm, Ottawa	Ayrshire, Holstein, Jersey, French-Canadian
	Kapuskasing	Ayrshire, Shorthorn
Manitoba	Brandon	Shorthorn (Dual-purpose)
	Morden	Ayrshire
Saskatchewan	Indian Head	Shorthorn
	Scott	Shorthorn
	Rosthern	Holstein
	Swift Current	Shorthorn
Alberta	Lacombe	Holstein, Aberdeen-Angus
British Columbia	Agassiz	Holstein
	Sidney	Jersey
	Invermere	Ayrshire

Tuberculosis Control

Regulations under the Animals Contagious Diseases Act provide for the inspection and testing of pure bred herds for bovine tuberculosis by the Veterinary Director General, and the accrediting of such herds.

Imported animals are subjected to the tuberculin test before admission to Canada, unless coming from accredited herds in the United States,

The present holder of the world's record for milk and butter fat production De Kol Plus Segis Dixie 25787 Owned by Donat Raymond Vaudreuil Que Bred in Canada

The previous world record holder the Holstein-Friesian Cow Agassiz Segis May Echo owned by the Dominion Experimental Farm, Agassiz, B C Bred in Canada

with which country a reciprocal arrangement exists.

The Dominion Municipal Tuberculosis Order, 1917, is designed to assist cities and towns to secure a tuberculosis free milk supply. Provision is made for the classification of dairy herds into Class "A" herds, which are tuberculosis free, and Class "B" herds, from which the milk must be pasteurized.

Record of Performance

The production of pure bred dairy cows is ascertained by a systematic weighing and testing of the milk, carried on according to the requirements of the Canadian Record of Performance. Cows that reach the production standard required by the associations representing the different breeds are granted certificates. This leads to the elimination of low producers, and to breeding only from high producing strains.

The Canadian record of performance for pure-bred dairy cows shows that the number of certificates issued to cows that had qualified up to April 1, 1923, was 8,029. According to breeds, the numbers were as follows: Holstein-Friesian, 3,227; Ayrshire, 2,541; Jersey, 1,316; Shorthorn, 653; Guernsey, 145; French Canadian, 135; Red Polled, 12.

World Records Held by Canadian Cows

The World's Record for the highest amount of butter fat produced in 365 days was obtained by "Bella Pontiac" in 1920-21, a Canadian bred cow owned by Thomas A. Barron, Brantford, Ontario. Her production was 27,191 pounds of milk and 1,270 pounds of fat.

In 1921-22, the world's record was secured by "Agassiz Segis May Echo," another Holstein-Freisian cow, bred and owned in Canada, the property of the Dominion Experimental Farm at Agassiz, British Columbia, with a record of 30.886 pounds of milk and 1,345 pounds of butter fat

Again, in 1923, the world's record for butter fat production was broken and is at present held by a Canadian bred cow. This is "Dekol Plus Segis Dixie," owned by D. Raymond, Vaudreuil, Quebec. This cow, freshening at the age of nine years and three months, produced, under official test, 33,477 3 pounds of milk, containing 1,686 5 pounds of butter in 365 consecutive days, this being the second time that she has been the title holder.

The world's championship for grade cows is also claimed for the Holstein-Freisian cow, "Dairy Maid," the property of Alex Davie, of Ladner, B.C., with a record of 22,514 pounds of milk and 1,132·06 pounds of butter in 365 days.

The statistics as to production and values quoted in this article were compiled by the Dominion Bureau of Statistics.

AGRICULTURAL LEGISLATION AND APPROPRIATIONS, 1923

DOMINION OF CANADA

An Act to Amend and Consolidate the Acts respecting Live Stock.—A consolidation of the original Act and amendments with certain additions. The act provides for the control of stock yards and stock exchanges associated therewith; for the inspection of animals prior to slaughter, and for establishment of egg-breaking plants. The act authorizes the control by regulation of the grading of hogs and other live stock at stock yards and abattoirs, and the grading of eggs and wool. The act controls also the manner in which meat, live stock, poultry, eggs, and wool imported into Canada shall be inspected, graded, branded, and put on the market. A new feature provides for the organization of export cattle associations.

An Act to amend the Animal Contagious Diseases Act.—The amendment provides that the maximum amount that may be paid in compensation for pure bred cattle slaughtered under the act shall be $150. No change was made with respect to the rate for grade animals. The act came into force on July 1, 1923.

An Act to amend the Dairy Industry Act, 1914.—The Dairy Industry Act, 1914, was so amended as to establish a minimum standard of eighty per cent fat in butter; to prohibit the manufacture, importation and sale of milk or cream containing any fat or oil other than that of milk; to provide by regulation that records be kept, available to inspectors, by manufacturers and dealers in butter and cheese, for the registration of cheese factories and creameries, and by assigning to each a number, which shall appear on the product itself or on the package containing goods of each respective factory.

The section dealing with fat in milk and cream does not come into effect until the first day of October, 1923.

Oleomargarine.- The Act permitting oleomargarine becomes ineffective as to importation and manufacture after August 31, 1923, and the sale of oleomargarine will cease on the last day of February, 1924.

An Act to regulate the Sale and Inspection of Fruit and Fruit Containers This Act, known as the Fruit Act, supersedes The Fruit Marks Act, 1901, and subsequent amendments thereto. The measure makes provision for new grade names for apples, crabapples and pears packed in boxes, and defines the capacity measurements of packages for apples, pears, cherries, plums, and berries. In the grading of apples, the terms No. 1, No. 2, Domestic and No. 3 as applied to apples, crabapples and pears packed in boxes, have been superseded by the designations "Extra Fancy," "Fancy" and "C Grade". In apples packed in barrels, the "Domestic" grade has been changed to increase the percentage free from worm holes from 80 to 90.

The Act provides for the use of a half barrel to be exactly one-half the size of the present standard apple and pear barrel, and prescribes definite dimensions for packages for plums, prunes, cherries, berries or currants to conform to the United States legal packages, as follows:—

All cherry boxes manufactured in Canada, and all boxes containing cherries packed in Canada for sale, must have a capacity measurement of (1) 729 cubic inches and (2) 364½ cubic inches, and must measure, inside, 18 inches by 9 inches by 4½ inches (containing 20 pounds net)

and 18 inches by 9 inches by 2¼ inches (containing 10 pounds net), respectively. The new standard plum or prune box will have a capacity measurement of 672¾ cubic inches and will measure inside 18 inches by 11½ inches by 3¼ inches.

After the first day of October, 1924, all berry and currant boxes must contain 67⅕ cubic inches (American quart), or 33⅗ cubic inches (American pint), instead of ⅘ quart, one pint and ⅖ quart as formerly. The new sizes will be standard in Canada from the date of the passing of the Act.

Further provisions require that fruit packed in open packages, bearing any of the grade marks specified in the Act, must comply with the grade requirements as defined therein. Also that the marks on boxes containing apples, pears and peaches shall include the number of specimens in each box. It is made an offence to handle fruit roughly in process of picking and packing.

A definition of the term "properly packed" has been included in the Act. Also where the words "slightly affected" are used in the definition of the Domestic grade, this is now specifically defined to mean "not over five per cent scab and five per cent other defects on each specimen. but in the aggregate not to exceed seven per cent of the surface of the fruit."

Sections 18 and 19 of the amended Act are designed to protect growers, shippers and shipping organizations, by providing a penalty for the unlawful use of a registered number or mark on open packages, and also for the use, by a person not entitled to it, of any brand belonging to a grower or shipper.

While the Act gives the capacity measurement of the various standard packages, the Minister of Agriculture, with the approval of the Governor in Council, may make regulations to prescribe the quality, form and dimensions of such containers; and, in addition, may authorize the manufacture and use under permit of twelve quart baskets for the bulk shipment of grapes. The Governor in Council may also by regulation prescribe packages containing imported fruit and the brands or marks to be used thereon.

An important clause provides that an inspection certificate, signed by an official inspector appointed under The Fruit Act, shall be *prima facie* evidence of the grade and condition of the fruit or packages to which the said certificate may refer.

In addition to the above, numerous other changes and amendments have been made which will be of material assistance in the development of the fruit industry in Canada.

An Act to amend the Root Vegetables Act.--A section is added to The Root Vegetables Act, providing that an inspection certificate, signed by an official inspector appointed under the act, shall be *prima facie* evidence of the grade and condition of the root vegetables or packages to which said certificate may refer.

An Act respecting the Testing, Inspection and Sale of Seeds—"The Seeds Act, 1923," replaces the Seed Control Act, 1911. The new Act retains the desirable features of the old Act and, in addition, enlarges the scope so as to include as stringent provisions as are contained in the seed laws of countries trading with Canada.

The original Act provided for the compulsory grading only of timothy, alsike, red clover, and alfalfa seeds. The new Act provides for the selling under grade only of all kinds of grass and clover seeds, flax, sorghum, millet, wheat, oats, barley, rye, corn, buckwheat, sunflower, field peas, field beans, and vetches. The grades are Registered, Extra No. 1, No. 1,

No. 2 and No. 3. Each grade represents definite standards of freedom from weeds and quality, while Registered and Extra No. 1 grades carry a guarantee as to purity of variety. Seed that will not grade at least No. 3 or No. 3 mixture is marked "Rejected" and prohibited from sale until recleaned to come within the standard grades.

Provision is made for the selling of field root and garden seeds, either under grade or labelled with certain information, including the percentage germination, when such germination is below a minimum percentage of germination fixed by regulation.

The Act prohibits the use of new variety names until licensed by the Minister, the use of false and spurious names, and provides for truth in advertising The latter provision aims to suppress the use of unreliable claims made for seed for the purpose of effecting sales.

Provisions for the exporting of seed under grade, and the importing of seed under definite regulations, are also contained in the Act.

The exemptions under the Act are similar to the old Act with the exception as to its application to farmers. The only seeds from which a farmer is exempted, when selling on his own premises for seeding by the purchaser himself, are cereal grains, buckwheat, field peas, field beans, and corn. Exemptions are not provided, however, for these seeds if they are represented and sold as conforming to the provisions of the Act. Elite stock seed produced by plant breeders is exempted under the new Act.

Provision is made for an Advisory Board to meet when called by the Minister for the purpose of recommending legislation or regulations under the Act. On this Board the seed trade and seed growers are equally represented, with the Seed Commissioner as Chairman to cast the deciding vote when necessary.

An Act to Amend the Feeding Stuffs Act.—The Feeding Stuffs Act of 1920 is amended so as to require that bran, pure shorts, shorts and mill screenings, middlings, feed flour, be kept separate and distinct when offered for sale; that each be free from any admixture of materials foreign to the process of flour milling. Regulations are to be made to establish the percentage of protein and fat contents, and the fineness and quality of each of the products named. The amending Act also fixes the maximum amount of crude fibre that shall be permitted in each of the feeds as follows: Bran, 11 5 per cent; Pure shorts, 8 0 per cent; Shorts and mill screenings, 8 0 per cent; Middlings, 4 5 per cent; Feed flour, 2 0 per cent.

No person shall manufacture both pure shorts, and shorts and mill screenings at the same mill. The Act requires honest labelling of containers in which the feeds are put up for sale.

DOMINION APPROPRIATIONS FOR AGRICULTURE

The money voted by Parliament for carrying on the work of the Department of Agriculture for the fiscal year 1923-24 amounts to the sum of $7,119,500 Following are the details with comparisons with the previous year —

—	1922 23	1923 4
	$	$
Civil Government	780 455	855 745
Experimental Farms	1 325 000	1 5[illegible]5 000
Entomology	28 000	30 000
Administration and Enforcement of Destructive Insect and Pest Act	240 000	310 000
Dairying	1 [illegible]5 00[illegible]	230 000
Cold Storage Warehouses including grants to New Westminster Cold Storage $10 000 and Grimsby Cold Storage $30 000	51 000	50 000
Fruit	157 000	182 000
Health of Animals (Administration and enforcement Animal Contagious Diseases Act and Meat and Canned Foods Act) including grant of $1 000 to National Veterinary Association	1 785 000	2 351 500
Publications	28 500	28 500
International Institute of Agriculture	15 000	20 000
Live Stock including grant of $6 000 to Stock Growers Protective Association	1 060 000	1 230 000
Seed Feed and Fertilizer Control	2[illegible]5 000	29[illegible] 000
Administration of the Agricultural Instruction Grant	20 000	[illegible]0 000
Grant to the Provinces of Canada for the purpose of assisting and encouraging agricultural instruction grants to be made on a proportionate basis	1 100 000	900 000
For experiments in the dehydration of fruits and vegetables		10 500
For expenditures in connection with trial shipments of chilled beef and fat cattle to Great Britain		[illegible]5 000
For the suppression of foul brood in bees		5 000
For the salary and expenses of an Agricultural Produce Marketing Agent in Great Britain		7 000
Miscellaneous items	49 50[illegible]	
	[illegible] 089 458	[illegible] 119 500

DOMINION EXPERIMENTAL FARMS

THE EXPERIMENTAL STATION, SCOTT, SASKATCHEWAN

By M J TINLINE Superintendent

THE Scott Experimental Station is located 100 miles west of the city of Saskatoon, and about 50 miles from the eastern boundary of Alberta, close to the Canadian National Railway and adjacent to the town of Scott The vast, treeless plain on which the Station is located is broken only by occasional ravines and a few small lakes The altitude is 2,153 feet above sea level The climatic conditions are somewhat similar to those existing in Manitoba and southern Saskatchewan, except that the yearly precipitation is approximately three inches less than is recorded at Brandon or Indian Head

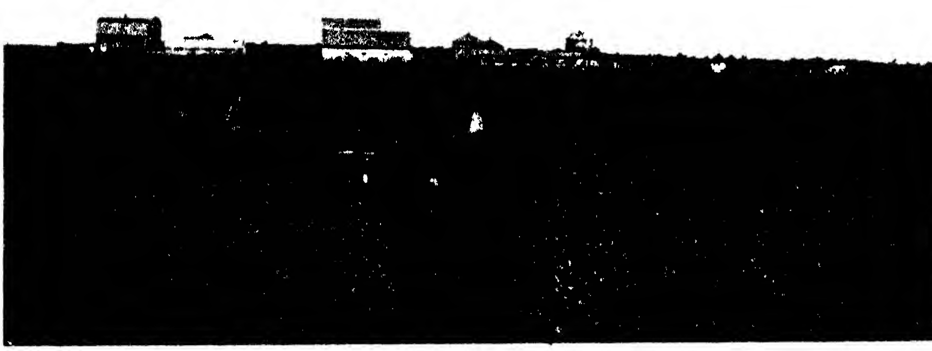
The district was first settled in 1906 by homesteaders, whose nearest railway point was Battleford The railway construction reached Scott in July, 1908 The Experimental Farm first consisted of 198½ acres of virgin prairie, a part of which was broken in 1910 In 1911, experimental work was started under the direction of Mr R E Everest In 1914, approximately 320 acres were added, of which about 200 acres was arable

land, the remainder being ravines which can only be used for pasture land.

The soil is a chocolate clay loam, fairly uniform, and is representative of the soil in many parts of the open plains sections of the Province. The fact that the soil is rich in plant food has been fully demonstrated by the high yields that have been secured in years when crop conditions were favourable.

The meteorological records at Scott Station for a period of eleven years show the annual precipitation to average slightly less than 14 inches. In only one year has the amount of moisture recorded exceeded 20 inches, and in two years it has been less than eight inches. The problems confronting the settlers and experimentalists are, therefore, essentially dry farming problems. They differ from the problems prevailing farther south in that the growing season is shorter and the summer nights are cooler.

Because the land could be quickly and cheaply brought under cultivation, the settlers naturally first turned their attention to the production of wheat, although flax, oats and barley were also grown. Later, livestock and poultry in limited numbers were raised on some farms. Some of the pioneers planted trees and, a few, vegetable gardens. Some of the settlers had had experience in other districts, which benefited them but little in this new climate; others were inexperienced. This made it necessary that the Experimental Farms should conduct experiments not only with grain crops, which were the main source of revenue, but that they experiment with livestock, poultry, forage crops, etc.



The Scott Saskatchewan, Experimental Station General View

Experimental work with cereals, crop rotations and cultural investigations was started in 1911. In 1912, an orchard, lawn and arboretum were established. In 1913, forage crop experiments were begun. Swine and sheep were introduced in 1916, but owing to the scanty pasture supply and lack of buildings, experiment with cattle were limited to winter finishing steers for market, until

1921, when the nucleus for a herd of Shorthorns was received from the Indian Head Experimental Farm. Horse breeding operations were started in 1911, and sufficient colts were raised to supply the horse labour for the rapidly increasing work on the Station. Four pure-bred Percherons were secured in 1920, which by natural increase have doubled their numbers. Twelve other work horses are required on the Station at present. There are now twenty-four pure-bred Shorthorns in the herd, and experimental work in winter feeding steers is still carried on each year. The flock of sheep, numbering 172 head, is composed of pure-bred Shropshires and Cheviots, and grade Shropshire, Cheviot and Rambouillet.

The main line of experimental work with sheep has been to determine the profitableness of this class of livestock for the dry land farmer. Pasture experiments with sheep have shown that sweet clover has a greater carrying capacity than any other forage crop. Experiments conducted during the past year have shown that the heavy losses resulting from goitre in lambs, which is so common in the West, can be largely prevented by the feeding of potassium iodide. Swine have proved profitable for the dry land farmer to keep, providing they are properly housed, fed and marketed. The experiments have included cross-breeding; methods of feeding, such as whole grain vs. crushed grain, rye vs. barley, self-feeder vs. trough method of feeding; pasture vs. no pasture, and buttermilk vs. no buttermilk. The results from these and other experiments are included in the Interim Report of the Station for the year 1922.

The winter feeding of steers has proved a profitable venture and is being encouraged as a means of increasing the farm revenue. This work provides employment for the surplus farm labour during the slack winter period; it permits marketing coarse grains profitably, and provides fertilizer that can be returned to the land to increase crop production. It is commonly supposed that the application of barnyard manure on the prairie soils is a waste of time. Experiments conducted at Scott during a seven-year period have clearly proved that it is profitable on the chocolate clay loam to apply all the manure that can possibly be obtained. The increase in yield from the first cropping period has paid for the cost of applying, and the beneficial effects of the manure continued through a period of several years.

Cultural Investigations

The farmer in the semi-arid districts depends mainly on frequent summer-fallowing to maintain crop yields. The experience in this district in recent years is that the summerfallow does not produce the increase in yields that has been claimed for it. This is no doubt due in part to the method of summer-fallowing. Experiments at the Station have demonstrated that the time of ploughing the summerfallow is much more important than the depth of ploughing. The earlier in the spring it can be ploughed, the greater the yield the following year; while a fairly complete set of experiments have failed to show any increase from ploughing deeper than six inches. Twice ploughing in the one summer has failed to increase yields, but it has kept weeds and grass in control better even than once ploughing. Crops of peas and vetches ploughed under for green manure have failed to increase yields of grain crops the following season. Commercial fertilizers have been unprofitable.

Two new lines of work are (1) ploughing the fallow in the autumn and cultivating throughout the next summer, and (2) growing grain in rows and intertilling instead of hav-

ing a bare fallow. During past years, turnips have been used as a summerfallow substitute, but the grain crops the next year have invariably been light. The turnips grow late in the autumn and thus exhaust the moisture that might be stored from the fall rains, and there is no residue from the turnips to hold the snow as there is from the grain crop grown in rows.

Experiments to determine the best method of handling the stubble from the first crop of grain after summerfallowing have shown that, where the land is clean and a good burn can be obtained, ploughing is unnecessary. On the mellow soil on the Station, sowing this land with a disc drill was all that was required. Owing to the fact that so much of the land in the district is poorly worked during the summerfallow year, this plan has not been profitable on many farms. The weeds and grass have grown up and robbed the grain crop of the moisture it so badly needed, and poor yields and weed infested land have resulted.

Spring ploughed land has generally given considerably higher yields than have fall ploughed fields. In fact, the experiments have shown that the destruction of the stubble in the autumn, whether by burning, discing or ploughing, decreased the returns to a marked extent compared with where similar work was done in the spring. The snow that packs in the stubble during the winter is evidently of great importance in districts where the rainfall is as light as at Scott.

A number of crop rotations were started on the Station in 1911. These included, first, the crop arrangement followed in this district, namely, wheat, wheat, summerfallow. In a second rotation the plan followed was to have one-half of the land producing grain, one-third down to grass and one-sixth summerfallow. Two other rotations were established to include peas, grass crops and the application of barnyard manure. Owing to the weeds that came up among the peas after the land was under cultivation for a few years, it was thought advisable to substitute sunflowers for peas

The Scott, Saskatchewan, Experimental Station.—Experiment with intertilled crops.

in one of these rotations and to mix sweet clover seed with western rye grass. One rotation did not prove satisfactory, and a number of shorter rotations more suited to dry farming conditions were started in 1921. One of these, known as a sweet clover rotation, is of particular interest at the present time. The crop sequence is: summer-fallow; wheat (on half the field, sweet clover is sown with the wheat. In the third year of the rotation the field is half sweet clover and the remainder oats. In the second cycle of the rotation the sweet clover is grown on the other half of the field.

Forage Crops

During the first years of settlement native upland grasses provided ample pasture and hay. The breaking of the native sod proceeded rapidly, with the result that, in a comparatively few years, hay became scarce and close grazing had decreased the carrying capacity of the pasture land. The inevitable result was that stock owners disposed of part of their herds. Grain farming proved profitable for a time, but an increase in weeds in practically every district, soil drifting in sections with light or loose top soils, insect pests, and rust in some sections, compelled farmers to turn their attention to diversified farming which should include the keeping of some live stock.

Foreseeing that the single crop system could not continue indefinitely, the Experimental Station has been conducting numerous experiments to determine the best method of seeding down to grass, the best crops to grow for pasture, and the best crops to provide roughage for winter feeding. These experiments have proved that it is possible to seed down to western rye grass with a nurse crop, that the introduction of grass in a rotation will aid in increasing the yields of grain following the grass, and that cultivated grass is not a profitable pasture crop. The experiments have shown sweet clover to be an outstanding pasture crop for most kinds of stock, while for swine, rape has proved the most satisfactory.

The Station commenced investigating the suitability of sunflowers for silage shortly after the Montana Station had pronounced them satisfactory for this purpose. One of the first silos in North-western Saskatchewan was erected at the Station. The silage, fed to steers that were being fattened for market, proved that it was worth $10.12 per ton during a three year period.

The information regarding the experimental work with forage crops was summarized in Circular No. 107, published in 1922.

Cereals

Experimental work with cereals has always received special attention on this Station. During the first years after the Station was established it was considered important that early maturing varieties should be tested in order to have the crops mature without frost damage. Repeated experiments have proved that the later maturing varieties give much heavier yields. This information has been placed before the farmers, and in one instance it is known to have prevented the farmers of a certain district from sowing several hundred acres of an early maturing variety of oats, which would have resulted in a loss in yield of at least from 10 to 15 bushels per acre. This estimated at even the low figure of $5 per acre would have meant a loss to these farmers of $3,500 in the one year.

Each season a number of crossbred sorts and selections, made at the Central Experimental Farm, have been tested to determine their usefulness for northwestern Saskatchewan conditions.

Testing newly introduced varieties has had a good effect in preventing the multiplication of varieties by the

process of giving some old variety a new name.

The multiplying of specially selected stock, secured from the Central Farm, has been followed. This work has been of great assistance in providing seed growers with good northern grown foundation seed at prices that were remunerative to the Station, while not being prohibitive to the grower.

Horticulture

Realizing that happiness and contentment are of greater importance than prosperity in inducing the settlers to decide to make the prairies their permanent place of abode, the Experimental Station has always, by precept and example, striven to encourage the planting of trees and windbreaks, the beautifying of the home surroundings with shrubs and flowers, and the establishment of gardens for vegetables and small fruits. The results of this work are quite apparent, particularly in the small towns and villages, a number of which have made a commencement in street tree planting, while the improvements in the village home surroundings are quite marked.

Owing to there being no native growth of trees or shrubs to guide the settlers as to what would grow on the prairies, and to few having any knowledge of horticultural work, it was necessary that investigational work should be started in order to determine what would grow under northern dry farming conditions. The second line of work was to determine the best cultural methods to employ in growing horticultural products. In this connection it is interesting to note that while apples have not thrived well, native Manitoba plum trees, secured from the Brandon Experimental Farm in 1914, have proved hardy and have, during the past two years, produced fair crops of from fair to good quality fruit. There has always been some doubt as to whether evergreen trees would thrive on clay soils on the open plains. The work of the Station has clearly demonstrated that white spruce and lodge-pole pine grow well here, and that a number of other evergreen trees can be grown. The cottonwood trees that thrive well in the dry districts farther south, winter kill badly in some years, while Russian poplar has proved hardy and a rapid grower.

The question of which way to run hedges for shelter for fruit trees is important, and it has been found that a more uniform distribution of snow resulted from having the hedges run east and west, and less breaking down of the branches on fruit trees occurs than where the hedges and trees run north and south.

The value of the windbreaks in protecting crops and in collecting snow to provide moisture for growth for the crops has been particularly evident during the last three years. Potatoes were grown inside the protecting hedges and in the open fields. The increase from the protected crops amounted on an average to over 100 per cent.

There has been some doubt as to which of the more frost tender of the commonly grown vegetables and flowering plants could be grown. The experiments have shown that, with proper care and by using a hotbed to start the more tender plants, everything that can be grown in the south of the province will thrive here.

THE EXPERIMENTAL STATION, LACOMBE, ALBERTA

By F. H. REED, Superintendent

THE Dominion Experimental Station for Central Alberta was established at Lacombe in March, 1907. Lacombe is centrally located in one of the largest live stock and mixed farming areas of the West. It is easily accessible, being located 115 miles north of Calgary and 80 miles south of Edmonton, on the Calgary and Edmonton trail, and on the Canadian Pacific line between Calgary and Edmonton. The C.P.R. also operates a line running east from Lacombe, and the Lacombe and Northwestern Railway line has opened up a large, new district to the west and north. The Canadian National Railway has a right-of-way into the town from its line five miles south.

The altitude of the Canadian Pacific railway station is 2,795 feet above sea level and its situation is 52° 28′ latitude and 113° 44′ W. longitude. The Experimental Station is situated about one mile southwest of the railway station and just on the southwest corner of the town.

The topography of the district shows a series of broad, fertile valleys. These valleys become broader and shallower towards the east until the open prairie is reached; while, towards the west, the valleys become narrower and the land rougher as the foothills grade into the mountains. The same type of country extends, with slight variations, southward as far as Calgary, and northward throughout the entire Edmonton district, and is situated in, or constitutes, the park belt of Alberta.

The soil of the district varies from a sandy to a dark chocolate loam, varying in depth from one to three feet, and is underlaid by a deep subsoil which varies from a gravelly loam to a stiff clay. The 490 acres of land on the Experimental Station, while fairly uniform in character, varies in places from a rich black loam four feet in depth, with stiff clay sub-soil, to a sandy loam one foot deep with sandy sub-soil. The farm is quite representative of the district.

Precipitation and temperature have proved to be the limiting factors in agricultural production in Central Alberta and the investigational work in agronomy conducted by the Station has largely consisted in determining the varieties of farm crops which will mature and produce maximum yields in the comparatively short growing season and the evolution of a suitable farm rotation which will not quickly deplete the soil of its virgin fertility and will still produce a profit under our particular conditions as to soil, topography, climate, markets, and transportation. The climate, topography and soil of the district make it particularly suited for live stock, hence work with live stock at the Station is one of its strongest features, and it naturally follows that investigational work with forage crops must be one of the most important branches for field crop experimentation. In outlining all experiments, the object has been to assist farmers in solving their present problems and to anticipate any problems that might arise as a result of the country merging from the ranching and homestead era into a highly developed type of agriculture. As some of the land at this Station has been under cultivation for thirty-one years, it is particularly adapted for this work.

Agronomy

Meteorological observations have been taken since 1908 and are important, for upon the general weather

conditions prevailing throughout the year, and particularly during the growing season, depend the quantity and quality of the crops grown. The average precipitation for the year 1908 to 1922 inclusive has been 17.034 inches. Of this, 61.47 per cent was received during the months May, June, July and August. The timely occurrence of this precipitation is partly responsible for the bumper crops usually harvested in the district. While June, July and August are the wettest months of the year, they also have the highest temperature. This moisture and heat, combined with sunshine from three o'clock in the morning until nine o'clock at night, forces a very rapid, strong growth.

When the Station was started in 1907, settlers were coming into the district in very large numbers, and these newcomers looked to the "Government Farm" as a reliable source of information. The first work was to determine what varieties of oats, wheat and barley were best adapted to the district, and extensive variety tests were carried on. The next problem was suitable crop rotations, with the ever-present problem of methods of weed control and eradication as the feature. Thirteen different farm rotations are now being carried out on areas large enough to permit of accurate cost of production results being secured. In 1911, an extensive series of cultural experiments was started. These comprised tests of many methods of stubble treatment, summer-fallow treatment, depths of ploughing, applying manure, dates, rates, and depths of seeding, methods of seeding down grasses and breaking sod, and the growing of roots and silage crops. The nine years' results now available from these experiments have provided very valuable information for both old and new settlers. As the country became settled, wild hay and pastures disappeared, and much work has since been done in testing varieties and strains of cultivated grasses hardy enough to stand the cold winters and, often, dry springs. It has been found that brome and western rye grass and some strains of alfalfa and sweet clovers from northern grown seed are quite hardy, and, in wet years, timothy will also produce heavy yields. More recent work has been the testing of varieties of corn and sunflowers for the production of silage crops.

In 1921, a new series of cultural experiments was started, based on the results of the previous experiments, and designed to cover some of the more recent problems of soil drifting, summer fallow substitutes, growing of grain in group rows, etc. This work requires eighteen acres divided into 480 plots. The thirteen rotations now under trial require 253 acres, divided into 52 blocks or small fields.

Since the Station was started in 1907, 55 varieties of spring wheat, 65 varieties of oats, 70 varieties of barley, and 25 varieties of field peas, have been grown on the variety plots. While a few of these have been found to be particularly adapted to the conditions of the district and have given outstanding yields, many varieties have proved quite unsuited and have been discarded. Similarly in the tests of grasses, clovers, corn, and sunflowers, with 25 strains of western rye, 15 of red clover, 5 of white Dutch, 5 of sweet clover, 8 of alfalfa, and 8 varieties of sunflowers and 14 varieties of corn, now under trial, results are proving that, while a few varieties and strains are well adapted to Central Alberta conditions, many are quite useless, and yet all of these varieties and strains of grains and grasses are to some extent on the market.

Live Stock

As, for the first few years, the Experimental Station included only one-

quarter section, very little work was done with live stock, but, with the development of the live stock industry in the district, herds of beef and dairy cattle were started, and, later, hogs and sheep. As Central Alberta has become one of the leading live stock areas of the West, the live stock at the Station has been increased until it is now one of the largest live stock stations of the Experimental Farms System.

Space will permit of only a brief mention of the live stock work and the numbers of animals used in the experiments. The herd of cattle kept by the Station numbers some 140 head. Two breeds, Aberdeen Angus and Holsteins, in approximately equal numbers, are kept. With both breeds, the cost of maintaining and developing the different classes of stock has been kept. In beef cattle, owing to lack of suitable stabling for such a large herd, work consists mainly of the development and distribution of breeding stock. With dairy cattle, however, more comprehensive work is under way, the chief lines being the testing of home-grown feeds for feeding for high production, the development of high producing strains of pure-breds, and the grading up of high producers from common grade cows. So far, very few breeding females have been sold, but annually several young bulls, of both the Angus and the Holstein breeds, have been sold to breeders in Alberta and British Columbia. All pure-bred milking cows are entered in the R.O.P. and R.O.M. tests and some very creditable records have been made. Sufficient milk from this herd is separated for feeding the young stock and the balance is manufactured into cheese in the dairy at the Station.

Some 900 sheep are kept by the Station. These are all used in a grading-up experiment, consisting of the use of pure-bred rams of Hampshire, Oxford, Shropshire, Leicester, Cheviot, and Corriedale breeding on common range ewes. This experiment has progressed to the second and third cross. With this flock, numerous experiments are conducted in methods of breeding, feeding and management.

The swine kept at the Station number about 300 head, of three breeds, Yorkshire, Berkshire and Duroc-Jersey. The three breeds are compared for prolificacy, economy of pork production, and suitability for the production of "select" bacon hogs The large numbers of hogs kept allows feeding experiments to be carried on with duplicate lots. The home grown grains, oats, barley, and low grade wheat, have been tried in almost every possible combination with and without skim milk and buttermilk, with and without pastures of many kinds, and fed by hand and in self feeders. This year, special attention is being given to the influence of feeds and methods of feeding on the suitability of the finished hog for bacon production. Annually, large numbers of young sows and boars are sold throughout the Province for breeding purposes.

Three breeds of horses are kept, Hackney, Clydesdale and Shire The five Shire horses donated to Canada by the English Shire Horse Society have been located at the Station. The three mares will form the foundation of a Shire breeding stud, and the two stallions are available to farmers to demonstrate the suitability of the Shire in producing draft horses of good type and size. Some breeding work has been done with pure-bred Clydesdales, but the Clydesdales, both grade and pure-bred, have been used mainly for the farm work. The Hackneys have been used as drivers and delivery horses.

White Wyandottes, Barred Rocks, and Single-combed Rhode Island Reds are the three breeds of hens kept, while Toulouse and African geese and Pekin ducks complete the

list of poultry. Practically all the young males available are sold to farmers in the surrounding district. In addition to the usual care and management experiments, pedigree work is under way with each of the three breeds of hens.

Horticulture

In horticulture and gardening, the Experimental Station at Lacombe has been of great service to the farmers of Central and Northern Alberta. It has demonstrated that probably in no part of Canada can vegetables and bush fruits of higher quality be produced, and that every farmer can, with a little effort and care, have a good farm garden. All the common vegetables do well in this soil and climate. Red and black currants and raspberries give heavy yields of excellent fruit and, with a little extra care, strawberries yield well. The arboretum contains the oldest and most complete collection of trees and shrubs north of Calgary, and an endeavour is being made to test all the perennial and annual flowers likely to prove suitable to northern conditions. As the country becomes older, these data are much in demand by farmers who are laying out lawns and gardens around their homes.

It is not possible, in an article of this kind, to give more than a brief summary of the different lines of work under way at the Station. The majority of our activities are of such character that a correct estimate of their value to the province is impossible. The Lacombe Station, however, has now been in operation for fifteen years, and its work has been closely followed by farmers, many of whom have repeatedly turned to the Station for suggestions, as new problems developed in their farming operations.

While, perhaps, the pioneer problems of farming in Central Alberta may now be said to have been fairly well solved, these have been and are being followed by others, of a more difficult and complex character, as farming operations have become diversified, markets have widened and cultural requirements have changed. Especially during the recent years of light rainfall, small yields and low prices, has the need of best varieties, best cultural methods, best breeding, care and management of live stock—all leading to lowest cost of production and greatest output—been most keenly felt. That this is realized by the farmers of Central Alberta is well shown by their interest in the work being carried on in their behalf by the Lacombe Experimental Station.

SEED GRAIN COMPETITIONS IN THE PROVINCE OF QUEBEC

By JULES SIMARD, District Inspector

SINCE 1920, endeavours have been made by the Quebec office of the Dominion Seed Branch to improve the grain crops of the Province by arranging seed grain competitions among farmers. These competitions are really standing crop competitions, extended as far as the preparation of the seed for sale.

The scheme was launched in 1919 when trial competitions were organized in the counties of Rimouski and Champlain, with a total of 103 entries. The object was to fill the gaps existing in the system that had been followed up to that time, and to generalize the use of good seed by making known the methods of selection

and spreading their use among the farmers To this end special instructions are given for the growing of seed grain, and cash grants are awarded to the farmers who grow a specified quantity according to those instructions.

The contests are organized under the auspices of the agricultural associations, with the co-operation of the Ottawa and Quebec Departments of Agriculture. A farmer desiring to enter the competition is required to own a certain amount of registered seed grain, or, at least, grain of a known variety and of standard quality. The variety must be approved by the Department. An area of three acres is necessary for a first examination of the standing crop, and points are given according to the general appearance of the crop, the absence of weeds and diseases, the system of cultivation, etc.

In the standing crop competitions, which were the only contests held previously, the work was limited to one inspection, and the prizes were awarded to the owners of the best fields. Well-to-do farmers sometimes entered these competitions only from a speculative point of view, and without obtaining results that would prove of use in the improvement of cereals. In the present seed grain contests, the farmer is required to prepare a large proportion of this grain for seed. On the second or cleaned seed inspection he is scored according to the thoroughness of the work done during the course of all his operations. Herein lies the superiority of the seed grain competitions over the standing crop competitions.

Since the establishment of these contests, the number of entries has been constantly increasing, and the quality of seed grain produced has steadily improved.

The following results were obtained during the last three years:—

Number of Counties	Number of Competitions	Number of Entries	Quantity of seed inspected	Percentage of seed under the grades			
				No 1	No 2	No 3	Ungraded
			Year 1920 1921				
11	16	472	8 885 bush oats.				
			9,720 lbs clover	..			
			Year 1921-1922				
15	24	644	13 225 bush oats	23	2		7
			6 900 lbs clover	23	9	28	40
			Year 1922-1923				
18	29	1,297	28,400 bush oats	33	50	17	
			7,500 lbs. clover	17	20	22	4

Before these competitions were established, standing crop competitions and seed grain exhibitions were held to encourage the farmer in the production and use of good seed. While these organizations gave good results, they did not induce the farmer to sow the whole of his farm with seed of good quality. Under the combined field crop and cleaned seed competitions a certain amount of grain—25 bushels for oats—must be treated for seed, the competitor is enabled to use seed grain that has been selected, and of pure variety and thus see for himself its advantages and superiority over ordinary seed grain, both by the increase in yield and the smaller number of weed seeds that it contains. He can therefore appreciate the benefits derived from selected seed and better understand the necessity for this work. He also becomes familiar with the best methods of cleaning the seed, and he introduces good seed-cleaning machines on his farm.

While inspecting threshed grain on the farm, judges may give useful advice regarding the methods of selection, the importance of this work, and the identification of noxious weeds, and they sometimes help in the sale of surplus seed grain.

Many farmers who have entered these competitions regularly are now convinced that the productivity of a variety is maintained and even increased by selection. Many also sell large quantities of seed grain and are among the most successful competitors at exhibitions.

The number of contests shows a steady increase since they were established—a sufficient proof of their popularity among farmers and of the benefits derived from them. The consensus of opinion is that the competitions are a means of distributing good varieties of grain among the farmers, that they encourage the use of methods of selection, and create an elite of farmers who are able to produce seed grain of good quality, of uniform variety, well adapted to climatic and soil conditions. These organizations have brought about a noticeable improvement in the quality of seed used in the province of Quebec. They have also been an important factor in increasing yields, as well as a practical means of making known the basic principles involved in the improvement of cereals. It is to be hoped that the good effects of this work will be felt for many years to come and that, as it becomes generalized throughout the province, the average yield of cereals will show a decided increase.

PART II

Provincial Departments of Agriculture

THE LIVE STOCK OUTLOOK IN SASKATCHEWAN

By A. M. SHAW, Professor of Animal Husbandry, College of Agriculture, University of Saskatchewan

IN discussing the question with farmers of the West, one is struck by the great divergence of views with regard to the outlook for live stock raising in the Province of Saskatchewan. Many people will tell you that it is not promising. Others farming in the same district, say that live stock—milk cows and chickens, have been their mainstay. Both parties are speaking from experience. How can we reconcile these two widely different conclusions? Are there two answers to this question? We think not. We venture to say that the first answer is prompted by the experience of a man who has tried to handle live stock on a comparatively large scale without much previous experience: who has endeavoured to handle live stock much as he would handle grain growing. His answer will always be the same because his methods are fundamentally wrong, and can never succeed except in exceptional cases. The second answer is prompted by the experience of a man who has kept live stock on a small scale as a means of livelihood and not as a money making venture. His answer also will always be the same, because his methods are fundamentally right, and when intelligently followed, will invariably bring success.

That live stock raising, or farming with live stock, should form an integral part of their business, is not well understood by all western farmers. Many of them have had little or no experience in the handling of farm animals other than horses. When these men, owing to difficulties encountered in straight grain growing, decide to go into live stock raising, they make the mistake of investing too heavily before they have learned the business or made the necessary changes in their system of farming, which eventually must take place when live stock raising is included in their farming operations.

All farmers recognize the importance of getting the land ready and the crop sown at the proper time. They know the importance of good seed and proper tillage methods. They know that a delay of a few days often means the difference between a good crop and a failure. They know the importance of having proper seeding and harvesting machinery. In fact they make full preparation, usually, for caring for the crop from seed time to harvest.

Do they all realize, however, the importance of keeping their live stock in good thrifty condition at all times, the importance of having their calves come at the proper time, and of caring for them so that they will be of the right age and weight at the proper time? Or, in the case of dairy cattle, do they appreciate the importance of adequate shelter and of proper and abundant feeds at all times?

To the uninitiated, sheep raising seems to present few difficulties. A man and a dog may look after a flock of many hundreds for months at a time. It looks easy, and it is easy to the man and his dog because they

have learned their business; they have had years of experience and know sheep and can anticipate and provide for every need. Turn them over to a novice and how quickly you will note a change in the well being of the flock.

It is no easy matter to change a straight grain growing business into one where live stock is included. Many changes must take place. Pastures must be provided, forage crops grown, intertilled crops introduced, a certain amount of fencing undertaken, and a start made along the line of suitable buildings for shelter. This cannot be done in a day; many years must elapse ere farming methods suited to grain growing—and after all they form a very large part of the methods in vogue in Saskatchewan—can be changed to include live stock as an integral part of the business. But the change must come. Farmers everywhere in the West are looking for a way out of their present difficulties. We think it lies in this direction, and that is why we are firm in our conviction that the outlook for live stock in Saskatchewan is promising, not immediately, perhaps, but eventually.

Live stock of all kinds yields the greatest return when kept in comparatively small numbers. Thus it is evident that the small or medium sized farm is the ideal unit for establishing a balanced system of farming. Handling live stock profitably on a very large scale is difficult in the extreme, except along certain very definite lines. For instance, a large grain farm could easily, and with profit, feed and finish steers or lambs during fall and winter months without interfering with its regular farming system. The question immediately is asked, Does it pay to feed cattle? This is answered beyond a question of a doubt by the results of experiments conducted by the Dominion Experimental Farms for the past twenty-five years. In each year, their cattle feeding operations have shown a profit, and in many of their trials the price obtained for coarse grains when fed to stock was more than double the market price, when sold as grain.

At the present time thousands of feeder cattle are being sacrificed on the western markets, selling for 2 cents to 3 cents per pound. These same cattle, if carried over until next spring and well finished, would bring from 7 cents to 8 cents per pound. Experienced cattle feeders claim that a spread of from 1½ cents to 2 cents between buying and selling price is sufficient to yield a profit to the feeder. In Western Canada the spread is double this amount almost every year. No argument can be put forward to prove that cattle feeding can not be carried on successfully in Western Canada. All the existing evidence goes to show clearly that it can be made to yield a handsome profit.

There is a lot of good blood in the live stock of Western Canada, evidence of which can be seen by the types and sound colours of the cattle on any western market. Lack of condition and finish are, however, painfully evident. Cattle are being marketed in an unfinished condition, and at the wrong time of year. This is conclusive proof that the men engaged in the business have not as yet thoroughly mastered it. They very frequently ship cattle apparently without any regard for the condition of the cattle or the condition of the market. This is one of the main reasons why our western cattle markets are in their present condition. They are glutted with cattle unfit for the trade. Good, well finished cattle are selling at fair figures even now.

How can progress be made along live stock lines? As has been already stated, the small or medium sized farm lends itself best to the successful

handling of live stock. The reason for this lies in the fact that live stock farming at its best must be carried on by the farmer and his immediate family, with perhaps one additional man by the year. This means that the number of animals kept must be limited. The actual numbers for a quarter or half section farm can not be stated definitely as the nature of the soil, the district in which the land is located, together with many other factors, will all have a bearing on the question. As a rule, however, the average farmer would be well advised to confine his efforts to the handling of from 5 to 15 milk cows, 8 to 10 steers for finishing, a flock of from 20 to 30 ewes, 1 or 2 brood sows, a flock of from 25 to 50 hens, and probably 4 to 8 horses. It is not necessary of course that each farmer keep all of the above kinds of animals, but herds and flocks of this size have been found by the actual experience of practical farmers to give the best returns under ordinary conditions.

Steer feeding to many men means the handling of steers in car lots. This is not necessary nor advisable. This year, from 50 to 100 car loads of feeder cattle have been shipped from Western Canada to one Ontario district to be finished by Ontario farmers, very few of whom will actually feed more than 8 or 10 head. This is true of dairying as well. Frequently, greater profits are derived from the milking of a few cows than when we endeavour to operate a large herd. Especially is this true in the case of beginners, and this is the class in which the majority of western farmers find themselves, as far as balanced farming is concerned.

Good breeding is essential, the use of pure-bred sires of the correct types imperative, but just at present, above all else, knowledge of proper methods of care and management is required. This can be gained best by experience, and for this reason the change that is at present taking place in Saskatchewan farming will proceed slowly but surely until some day western agriculture will be on a much firmer basis than it ever was before. And when that day comes it will be found that, to a very great extent, the live stock industry has become the mainstay of the average farmer of Western Canada.

GRASSHOPPER CONTROL IN ALBERTA

By C G. GROFF, Editor of Publications, Department of Agriculture, Alberta

THE Province of Alberta spent just over half a million dollars in the season of 1922 in the destruction of grasshoppers, but saved to the farmers of the province approximately 20 million dollars' worth of crop, according to returns received by the Department of Agriculture from municipal secretaries and others. Of the total cost of $512,253, the municipalities and local improvement districts are charged with $257,040, the Provincial Government bearing the balance. The story of the campaign and its immense success forms an outstanding example of the successful result of organized and concentrated government, municipal and community effort. Not only government officials, but municipal authorities, farmers, and even the citizens of the towns and some of the cities in the infested area, played their part in winning victory over a pest that threatened to wipe out the crop vegetation and rob the farmers, over nearly three-quarters of the crop-producing area of the province, of the fruits of their labours.

The same effective organization has been maintained for 1923, with the inclusion of two or three new areas. So successful was the campaign last year, however, that several communities thought their troubles in respect to grasshoppers were over, and became somewhat off their guard this season, with the result that poisoning was not done in these particular districts early enough, and there will be a small percentage of loss there. But with the campaign proceeding vigorously along the lines established in 1922, and with the infested areas now greatly reduced, the outlook this season is for a very small percentage of loss over the province, and the feeling is given support in government circles that the pest is being brought very effectively under control.

One of the results of the effective campaign of last year is that there is no serious infestation save in the south-eastern portion of the province bordering on Saskatchewan, in the territory east of a line from Lethbridge to Youngstown.

Grasshopper infestation in Alberta became serious some years ago, but aside from government efforts to educate the farmers in the matter of applying poison bait, and to provide material at certain centres, there was no real or united effort to combat the pest. It was at the beginning of 1922 that the Minister of Agriculture and his officials realized that a combined effort on the part of all concerned was needed if the crops of a large portion of the province were to be saved from devastation. Alberta by this time had begun to feel the effects of lack of action in Montana, where infestation was enormous, and from which large flights into Alberta had taken place. This, combined with ever-increasing local infestations, and the realization that individual effort on the part of farmers alone could avail little in checking the pest, brought the situation to the stage where organization of every available force was necessary. The Minister of Agriculture determined on such an organization. The government force was organized, and the councils of rural municipalities, villages, towns and even cities were brought into line in a great co-operative war on the hoppers. Every possible medium of education was utilized. Pamphlets describing the bait and its use, and the construction of mixers were issued and scattered broadcast. Meetings were held at every possible point, and newspapers gave generously of their space.

During the session of the Legislature a Pest Act was passed, making it compulsory for farmers to take action to destroy the hoppers, and also providing machinery for organization.

The organization was placed in charge of Z. McIlmoyle, Assistant Deputy Minister of Agriculture, with Prof. E. H. Strickland, Entomologist of the Alberta University, and former Dominion Government Entomologist, in charge of the field work. The organization included 170 municipal and local improvement districts, exclusive of the Peace River district, the area infested comprising almost the entire portion of the province south of the City of Edmonton.

The government force consisted of 22 supervisors, each of whom had under his jurisdiction some 6 municipalities or improvement districts. Under the direction of these supervisors the responsibility for the campaign was placed on the council of each municipality, with each councillor responsible for his own division. Materials were supplied to these municipalities at half price. The municipalities hired their own men and set up their own bait mixers. In local improvement districts the government agent organized the district and held meetings, scouts were appointed to see that infested areas

were poisoned, and the government supplied the bait mixers and paid the men who ran them, the cost being charged against the district.

District centres for the distribution of bait material in less than car-lots, were established at Edmonton, Calgary, Lethbridge, Medicine Hat and Munson. Carloads of material were shipped direct from supply houses to districts requiring them.

A total of 215 bait-mixing stations were in operation, and some of them ran night and day. In addition to the government force of 22 supervisors and two clerks, 183 men were used in local improvement districts, as well as the large staff used by the various municipalities.

The materials used during the campaign included 668 tons of molasses, 642 tons of arsenic and paris green, 6,413 tons of bran, 6,959 tons of sawdust, 810 tons of salt, 142 gallons of amylacetate.

Community campaigns were undertaken in several districts with great success. The first to be organized was at Crystal Lake, under H. L. Seamans, the Dominion Government Entomologist at Lethbridge. Every breeding ground and infested field in the area covered by this community organization was poisoned by the united action of all residents within a period of three days after the hoppers first made their appearance. Such concentrated effort so greatly reduced the pest that very little individual action was required during the remainder of the season, and the destruction of crops was reduced to a minimum.

The contrast was noted in an adjoining district where every effort made to obtain concerted action failed, and where individual farmers were loth to apply bait to land not their own till serious damage rendered such action imperative. It was then too late to obtain best results. In this district immense quantities of bait were used continually throughout the season, but in spite of this there was some loss in crop.

Exceptionally good results were obtained in other districts where community action was taken, notably in the Pakowki Lake district, where, in spite of the fact that countless millions of the hoppers threatened destruction of all vegetation in several municipalities, the loss of crop was negligible.

The citizens of the city of Medicine Hat poisoned many square miles of severely infested land, the Rotary Club and Board of Trade playing a prominent part in the work, and similar campaigns were conducted at Lethbridge, and in the towns of Taber and Champion.

Species of Hoppers

The whole of the area covered by the organization was found infested with what is known as the Roadside Grasshopper The eggs of this species hatched about May 26, and the hoppers were flying about June 28.

In the southern portion of the province, in addition to the roadside hopper, there was a severe infestation of the Lesser Migratory hopper, which covered a territory of about 50 districts, all lying south of the main line of the Canadian Pacific Railway. This species hatched about May 20, and were flying about June 26. In this territory also the two-striped grasshopper and the closely allied *Melanoplus gladstonii,* Mr. Strickland declares in his report, were present in destructive numbers. Throughout the province all species of grass-inhabiting hoppers were unusually abundant, but many were comparatively harmless. Mr. Strickland also states in his report covering the operations of last season that there is a gratifying increase in the numbers of parasites.

Bait Formula

The bait used in 1922 was composed of 50 pounds of bran and 50 pounds of sawdust, with five pounds of salt, and two gallons of molasses, five pounds of arsenic and ten gallons of water. As a result of last season's experiences, however, it has been found possible this year to cut the amount of molasses to one gallon or even ½ gallon per 100 pounds, and the salt and arsenic to four pounds each instead of five pounds. This has been found to give as good results and has reduced the cost considerably. To the formula described above, it was customary in some cases to add amyl-acetate to the extent of 3 ounces, after June 15, as an additional attractant.

In the handling of bait it was found that the bait became more effective if allowed to stand two or three days to become slightly sour, and then re-moistened before being scattered. The bait should not, it was found, be kept more than six days.

Time to Apply Bait

Bait was found to be most effective when applied between the hours of 6.30 and 10 in the morning, before the bait had dried out under the sun, and during the hours when the hoppers were feeding. Bait scattered before sunrise, or later in the day or in the evening, was found generally to be ineffective.

Method of Applying

The general method of applying bait to grain fields was to scatter it along the edges of the fields. This method was adopted particularly for the roadside grasshopper, but the lesser migratory species had to be met by application of bait throughout the entire field in strips of from two to five rods apart.

Vacant Land

The great areas of vacant land in the province were found to be infested only with the comparatively harmless grass-feeding species. The foothill country and coulees, which in former years had proved fertile fields of infestation, were found to be almost entirely free of the pest. Excellent work was done by the railway companies and irrigation companies in the treatment of vacant lands where necessary.

Abandoned farms constituted a difficult problem particularly in the sandy areas of the south. Farmers neighbouring on these farms were urged to poison these areas, but this work required immense quantities of bait, especially when left till late in June, and rarely more than a 50 per cent kill was obtained. It is now recommended that municipal authorities have such farms burned over during the last week in May.

In the treatment of summerfallow, Mr. Strickland recommends the strip method of summerfallowing, the strips being poisoned before ploughing or discing is completed. This makes for economy in use of bait and is more effective.

Fields of rye were found to be infested and necessitated poisoning during the entire season. Fall poisoning is recommended for this crop, but spring poisoning should not start until the last week in May, when all the eggs will have hatched, says Mr. Strickland. If a portion of an infested field is to be cut for hay, it is advisable to cut in strips of one or two binder widths from 5 to 70 rods apart. Within a few days the hoppers will gather along the edges of the cut strips to sun themselves, and they can then be quite economically poisoned.

Danger to Stock

Where bait was left in bulk and easy of access by livestock, or where it was carelessly scattered so that there was any quantity in one spot, there was loss of livestock. With careful

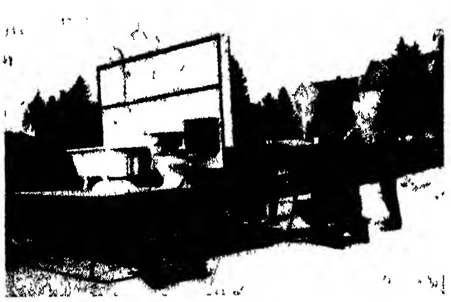
handling and scattering of bait according to directions, there can be no danger to stock.

Alberta learned some new lessons in the campaign, but the outstanding feature was the great success of the united campaign. Changes have been made in the Pest Act to make it more workable, and to lay penalties on those who waste bait unnecessarily.

THE WATER SUPPLY IN THE FARM HOUSE

By L. STEVENSON, B S.A., Director of Extension, Ontario Agricultural College

A MOTOR truck with a specially constructed extension platform top, loaded with an exhibit of pumps, plumbing equipment, tools and demonstrating materials related to household water supply installation, left the offices of the Department of Agriculture on May 23 to tour Western Ontario. This demonstration on wheels was prepared under the direction of the Superintendent of Women's Institutes for the purpose of illustrating to the people of the rural districts the best way in which to install or improve the household conveniences so necessary in the reduction of labour in the farm home. Water in the kitchen, in the bathroom and in the laundry, together with the disposal of sewage, at a cost in keeping with the farm exchequer, the purchase of the proper type of equipment, and advice on farm plumbing were the main thoughts in the demonstration.



Motor truck demonstrating kitchen and bathroom equipment and installation.

Farm surveys have shown that too few farm houses are equipped with any water service, and that many are not taking advantage of the natural conditions that surround them. Carrying water from a spring when either a gravity line or a hydraulic ram would deliver a water supply at the kitchen sink is a waste of time and energy still being practised. The unsanitary cesspool is still being used in spite of the fact that the septic tank is known to many, and is a convenience within the reach of all. The demonstration was in charge of two capable officials, well versed in plumbing and sanitary engineering, and as prearranged and advertised, attended gatherings of rural people under the auspices of the local Women's Institute.

Complete plumbing equipment for kitchen and bathroom was set up and demonstrated at each gathering. The work of piecing together the various parts of the equipment was done in such a way as to make clear the mysteries of plumbing to the handyman of the farm, enabling him to return to his own home and put in like equipment with his own hands and tools. Plumbers' bills have frightened most farmers who have been unfortunate enough to see them, and it has been this high cost factor that has kept the labour-saving water equipment out of many farm homes.

One demonstration stand per day was the practice, thus giving the people of the various districts visited an opportunity of inspecting the ex-

hibit at their own convenience, at any time between noon and nine p.m., and of consulting with the officials in charge. A general meeting was held early in the evening at each point visited. The officials in charge were able to visit, on request, many farm dwellings and give expert advice on the ground, while passing from place to place during the early part of the day.

The attendance at these Farm Household Water and Sewage System Demonstrations was large and enthusiastic. It is the aim of the Department to encourage the development of an inexpensive and efficient form of plumbing equipment that is simple in installation, so that the farmer can install it himself. The bringing of water pipes into the house and the replacement of the old-fashioned dish pan by the modern sink is the first object sought. With this accomplished, the rest will follow.

THE AGRICULTURAL SOCIETIES OF NEW BRUNSWICK

THEIR ORIGIN AND HISTORY

By M. A. MACLEOD, Superintendent

WHEN New Brunswick ceased to be the country of Sunbury, Nova Scotia, and became a separate province, in 1783, there was no department for Agriculture or kindred organization to foster the development of her agricultural possibilities. For the next half a century, the annals of the province do not contain a great deal of information respecting the operations of organizations that came into being with the avowed purpose of developing the latent agricultural resources of the new province. Neither do the public accounts show any great provincial expenditure for this purpose.

The first agricultural society founded in New Brunswick was organized in the city of St. John, under the patronage of Governor Carleton, in the year 1790, and was composed of men ready to lead or second any effort to advance the agricultural interests of the province.

The Agricultural and Emigrant Society was organized in Fredericton in 1825, and it was due to the efforts of this society that New Brunswick acquired the honour of being the first province of Canada to import pure-bred cattle from Great Britain. This was made possible by grants given by the Provincial Government to the society in 1826. Subsequent live-stock importations were made until, in 1858, the grants for this purpose totalled upwards of £5,000. These importations laid the foundation from fifty to seventy-five years ago, of the best herds to be found here.

In the 1839 speech from the throne, the Lieutenant Governor, Sir John Harvey, said: "To the enlightened legislature of a country whose soil is eminently fertile and whose climate requires nothing but a system of agriculture properly adapted to it to ensure to the cultivator a certain and abundant return, it can scarcely be necessary to suggest the advantages of giving encouragement to agricultural pursuits. The mode by which this important object may be best effected, it will be for you to decide."

The committee to whom this portion of the address was referred reported: "That having had under consideration the several subjects re-

lating to this important subject we are of opinion that it would tend materially to advance the prosperity of the province if Agricultural Societies were founded in different and conveniently situated districts of the several counties for the purpose of encouraging, by their protection and influence and example, the general agricultural prosperity." With these views, the committee recommended that a suitable grant of money be made to His Excellency the Lieutenant Governor, such sum to be divided among and limited to the respective counties according to their relative importance for the purpose of encouraging the establishment of Agricultural Societies and promoting the objects thereof.

This report was negatived in 1839, but in 1840, Sir John in the speech from the throne said:—

"I feel that I ought not to refrain from again inviting your attention to those interests upon which the ultimate prosperity of New Brunswick appear to me to depend, in a far higher degree than either upon its timber or mineral treasures, valuable and apparently exhaustless as are the latter—I refer to those of agriculture."

The committee reiterated their report of the previous year, and it received the sanction of the Government. Thus, in 1840, began the systematic apportioning of annual grants to Agricultural Societies in New Brunswick. The sum of £100 was allotted to each county on the following basis:—

"Which sum, or aliquot portions thereof, shall be paid to the presidents of the respective societies already formed or that may be formed, when it shall be certified to His Excellency that the inhabitants of the several counties have subscribed and paid a sum equal to one-half the sum above mentioned, or to the said aliquot portions, which sums so paid shall be accounted for to the Legislature: Provided always that in such counties where District Agricultural Societies be founded, embracing one or more parishes only, it shall and may be lawful for His Excellency to apportion the amount so granted for the county among the said agricultural societies."

In 1843 the proviso was added "that no warrant do issue for such sums, or any part thereof, until an account current for the past year of the society for whose benefit such application may be made, duly attested by the treasurer, be first laid before His Excellency the Lieutenant-Governor or Administrator of the Government for the time being, to be laid before the Legislature at its next meeting. In 1856 the annual grant to Agricultural Societies was placed at £2,800 with not more than £200 to any one county. This amount has been augmented from time to time until now the annual grant has reached the $24,000 mark.

The first advance towards the establishment of a Department of Agriculture in New Brunswick was made in 1853, when an Agricultural Committee was appointed, consisting of one member for each county, to whom all matters relative to agricultural interests were referred.

With the granting to New Brunswick in 1855 of a full measure of responsible government, came, from time to time, changes that tended to the progressive development of agriculture in the province.

A Provincial Board of Agriculture was appointed in 1859. This board consisted of one man from each county, three members of the executive council and the professor of chemistry at King's College, any five to form a quorum. Their duties included the advising of the Government respecting any improvements that might be deemed advisable in the application of the grants to agricultural societies for objects likely to produce more permanent and advantageous results

to the agricultural interest of the province. The board also directed attention to the advantages which might result from the establishment of a Model Farm and an Agricultural School to which the youth of the country might resort for instruction in agricultural chemistry and the most approved modes of practical husbandry. The Board of Agriculture functioned until 1874, when a Secretary for Agriculture was appointed and its duties were transferred to the immediate supervision of the Government.

The Board was again reorganized in 1880, when it consisted of one member of the Executive Council, without salary, and six men appointed by the Governor in Council from the nominees of the officers of Agricultural Societies. After the reorganization of the Board, the office of Secretary of Agriculture was abolished. The Board functioned until 1888, when the present Agricultural Act, which makes provision for a Minister of Agriculture and a Deputy Minister of Secretary for Agriculture came in force.

The Agricultural Societies co-operated with the Board in the matter of establishing the Model Farm and in the importation of live stock, to the extent of remitting a portion of their annual grant to help along those projects. The Model Farm did not fulfil the expectations of its founders, and it has long since been dismantled. The vision was not, however, a myth. To-day experimental stations and demonstration farms are fulfilling the objects aimed at by these worthy men, and the Agricultural College at Truro, Nova Scotia, short courses, etc., are doing for our young men who wish to take advantage thereof, what the mooted schools of over sixty years ago claimed they would do. At the present time an agricultural school is being erected on the Experimental Station at Fredericton, New Brunswick, where it is hoped that many of the sons of members of our Agricultural Societies may gain some of the advantages sought for them in the early sixties by the Board of Agriculture. There the sons of our English, Scotch, Irish, French and Danish farmers may get together to study the trade of their fathers and cement for all time the friendship that prevails among all classes in this province without prejudice to race or creed. There, too, the traits of leadership will be developed, and each young man as he returns to his home district will be an added tower of strength to agricultural organization in his community.

New Brunswick Agricultural Societies have increased in number and influence until, at the present time, there are 152 societies in good standing, including a membership of upwards of nine thousand farmers, who subscribe in the vicinity of $14,500 annually. The minimum requirement to qualify for a charter and grant in any community is 25 members and subscriptions totalling $50. This standard must be annually maintained in order to qualify and keep in good standing from year to year.

The annual appropriation of $24,000 makes provision for the placing of *The Maritime Farmer*, the official organ of the Department of Agriculture, in the hands of every farmer when he becomes a member of the local Agricultural Society. The balance of the grant, approximately $19,000, is allotted to the societies on the basis of one-half of this amount divided equally among the societies. The remaining half is apportioned to each society at the rate of so many cents per dollar subscribed and paid into the treasury.

An Agricultural Society Division of the Department of Agriculture was created in 1913, and a Superintendent was put in charge thereof.

Among the activities of our Agricultural Societies are the improve-

ment of live stock, the co-operative handling of fertilizers, feeds, seeds, spraying materials, and other commodities, the sale of surplus live stock and crops, the holding of fairs, exhibitions and kindred competitions, and by no means the least, the development of active social life and the dissemination of agricultural knowledge through the medium of meetings, which are frequently visited and addressed by members of the staff of the Departments of Agriculture. There are fewer complaints of a lack of local leadership and of difficulty in maintaining interest in districts where frequent meetings to talk over their problems are held. It may be said, therefore, that the Agricultural Society is the medium through which the Departments of Agriculture get any organized effort in the interests of the rank and file of our farmers put into effect.

The most lasting good is being accomplished by the Societies that pay particular attention to the improvement of live stock through the introduction of pure bred sires, and in this they are assisted by generous bonuses given by the Provincial Department of Agriculture. Live stock improvement is paramount to any commercial venture, and the money thus judiciously expended gives better returns than where expended for exhibition purposes.

The first Provincial Exhibition was held in Fredericton in the year 1852. The next one was held in Sussex in 1861, and the third in Sackville in 1872. Since that time, fairs of a provincial or interprovincial nature have been annually held in several centres of the province, as well as a number of county and district fairs, the majority of which are held under the auspices of Agricultural Societies.

This resumé of the origin and partial history of New Brunswick Agricultural Societies would not be complete without making a passing reference to several provincial organizations that comprise many members of Agricultural Societies, and which have very materially helped to coordinate their province-wide endeavours.

The New Brunswick Farmers' and Dairymen's Association was organized in 1876. It comprises delegates from the various Agricultural Societies, who meet annually in convention to discuss matters relative to their industry and, as a farmers' parliament, advise the Government re legislation in which the farmers are generally interested.

The New Brunswick Fruit Growers' Association, organized in 1904, assists members of Agricultural Societies and other fruit growers in the co-operative purchase of spraying materials, shipping packages, trees, plants, etc., as well as in some of their marketing problems, and has in every respect proved a most useful organization.

The New Brunswick Agricultural Societies United, organized in 1914, combines the fertilizer buying powers of the members of all agricultural societies that purchase fertilizers cooperatively. The chemicals are purchased and mixed at home in formulae to suit, and thus a monetary saving is effected.

The New Brunswick Dairymen United, organized in 1919, comprises representative milk producers, milk dealers, dairy produce dealers, cheese factory owners, creamery owners, cheese makers and butter makers who conduct an annual convention and cheese and butter show in conjunction with the annual meeting of the New Brunswick Farmers' and Dairymen's Association. They also conduct a fortnightly cheese and butter board, which has more than justified its creation

A perusal of the minutes of Agricultural Society meetings, held in the forties and later, reveals the fact that some of the deliberations of that time were on subjects that are considered quite up-to-date nowadays. They reveal men of vision, intelligence and energy who had the good of future generations at heart. They were laying the foundation strongly and well, with a view to leaving a noble heritage to their children and their children's children. Our opportunities are better to-day. Let us make the best use of them.

The calibre of any agricultural society is no greater than that of the men that comprise its membership. The good accomplished by our agricultural societies in the respective communities varies according to the measure of energy and intelligence that the rank and file of the members exert for the common weal of the community.

PROVINCIAL AGRICULTURAL LEGISLATION, 1923

ONTARIO

Consolidated Cheese Factories Act.—Under this Act loans may be granted by the Minister of Agriculture, with the approval of the Lieutenant-Governor in Council, out of any moneys appropriated for the purpose by the Legislature from time to time towards the erection of consolidated cheese factories. Every loan shall be secured by a first mortgage on the lands upon which the factory is erected and in respect of which the loan is made. No amount in excess of 80 per cent of the value of the lands and buildings shall be loaned. The rate of interest is to be five per cent per annum. The application for a loan may be made by milk producers in any part of the Province of Ontario who desire to erect a modern dairy plant to take the place of two or more smaller ones and who have agreed to supply annually three million pounds of milk to the said dairy. The applicants shall form a co-operative company and subscribe for stock to the amount sufficient, in the opinion of the Minister, to finance the enterprise. Twenty per cent of the par value of such stock is to be paid at the time of subscription, and the balance deducted from the value of the milk delivered at the factory, at a rate not less than three per cent, nor more than five per cent, until the stock is fully paid up. The moneys received on account of stock are to be deposited in a trust fund, and shall at the end of each three months be paid over to the Minister of Agriculture, to be applied for the repayment of the moneys advanced. A shareholder cannot hold over five shares, nor have more than one vote. The site, plan and equipment of every factory in respect of which a loan is advanced under this Act is subject to the approval of the Minister, but the company manages the factory, provided the Minister has the right to name one director on the board, until such time as the loan is fully paid.

Agricultural Development Act Amendments.—The amount that may be loaned for the removal of encumbrances, which means mainly the discharge of mortgages, is increased from 40 per cent to 50 per cent.

It was also provided that loans may be granted to persons who had resided in Canada for three years, instead of Ontario for three years, as formerly. That a loan may be discharged in full at any time.

In the case of loans on properties of less than fifty acres, it is provided that the maximum valuation to be

recognized by the Boards shall be $300 an acre.

The purposes for which loans may be made are extended to include the purchase of breeding live stock, and the consolidation of outstanding liabilities incurred for productive agricultural purposes.

AGRICULTURAL APPROPRIATIONS

—	12 months ending October 31, 1923	12 months ending October 31, 1924
	$	$
Civil Government	111,150	112,125
Agricultural and Horticultural Societies	202,456	201,850
Live Stock Branch	129,200	133,200
Institutes	43,800	43,800
Dairy Branch	178,400	186,400
Fruit Branch	91,950	83,950
Agricultural Representatives Branch	167,000	192,000
Ontario Veterinary College	38,760	37,260
Western Ontario Experimental Farm	20,000	20,000
Miscellaneous	149,950	158,228
Ontario Agricultural College:		
Administration, maintenance and teaching	337,600	332,750
Macdonald Institute and Hall	57,822	57,822
Forestry	1,000	1,000
Animal Husbandry, Farm and Experimental Feeding Department	38,260	38 260
Field Experiments	21,910	21,910
Experimental Dairy Department	14,600	14,000
Dairy School	9,350	9,350
Poultry Department	26,133	26,133
Horticultural Department	28,800	29,750
Apicultural Department	14,050	11,050
Bacteriology	4,700	4,700
Botany	4,170	4,170
Chemistry	6,020	6,020
Entomology	5,150	5,150
English	1,340	1,340
Manual Training	3,550	3,550
Physics	16,020	16,020
Farm Economics	27,075	27,075
Total	1,750,216	1,778,863

QUEBEC

AGRICULTURAL LEGISLATION

The only important legislation relating to agriculture passed at the 1923 session of the Legislature of the Province of Quebec was an Act providing for the union of the three principal co-operative societies, namely, The Farmers' Central Co-operative, the Comptoir Co-operative of Montreal, and the Co-operative Society of Seed Producers of Quebec.

APPROPRIATIONS

—	1922-23	1923-24
	$	$
Agricultural Societies	100,000	100,000
Farmers' Clubs	65,000	65,000
Encouragement of agriculture in general including Demonstration Farms	350,000	500,000
Pomological and Fruit Growing Society	500	500
Council of Agriculture	3,000	3,000
Agricultural Schools	90,000	90,000
Veterinary Instruction	......	9,500
House-keeping Schools (Ecoles ménagères)	30,000	30,000
Dairy Association of the Province of Quebec	2,000	2,000
Dairy School of the Province of Quebec, St. Hyacinthe, and official Laboratory	25,000	25,000
Dairy Industry and inspection of factories for the manufacture of dairy products	130,000	135,000
Horticulture	25,000	25,000
Journal of Agriculture	27,000	27,000
Aviculture	15,000	15,000
Apiculture	10,000	15,000
Exhibitions	32,000	35,000
Civil Government—Salaries	55,533	62,350
Total	966,033	1,139,350

MANITOBA

AGRICULTURAL LEGISLATION

Bill 102 is enabling legislation giving "The Live Stock and Live Stock Products Act, 1917" (Canada), the same force of law in the Province of Manitoba as if it were a provincial Act.

Bill 103 is an Act to enable municipalities to borrow limited amounts of money for seed grain purposes, and prescribes the manner in which such moneys shall be borrowed. The amount is limited to $60,000 in any one municipality. This Act remains in force for six months, and makes provision that the Lieutenant-Governor-in-Council may guarantee any debentures issued by any municipality for the raising of funds to expend on procuring seed grain for farmers. It also provides that a separate and distinct seed grain account must be maintained by a municipality operating under this act. The amount to be loaned to any one individual is limited to $1,000 and no loan can be made to a tenant except with the consent of the owner. All by-laws passed by a council pursuant to the provisions of this Act shall, before becoming effective, be submitted to the Municipal Commissioner. Debentures issued under this Act for the purposes enumerated shall form no part of the general debt of the municipality. Nothing in this Act shall prevent any member of a council from applying for and receiving seed grain under the provisions of this Act. Promissory notes given to a municipality for seed grain supplied pursuant to this Act may, within thirty days of the making thereof be filed in the office of the clerk of the county court in the Judicial district in which the land on which the seed is to be sown is situated, and the municipality shall have a preferential lien upon that crop, and unless they make their collections from that crop the lien will operate against the land as an ordinary charge enjoying no precedence over prior charges.

APPROPRIATIONS

	1921-22	1922-23
	$	$
Salaries, supplies and Expenses (Civil Government)	13 725	18 600
Agriculture	157,405	173 820
Manitoba Agricultural College	254 550	318 070
Agricultural Publications	16 525	20 700
Miscellaneous and Unforeseen	2 250	3 000
Birtle Demonstration Farm	4 250	5 120
Agricultural Survey	11 250	750
Marketing Investigation	1 000	1 000
Total	460 955	541 060

SASKATCHEWAN

AGRICULTURAL LEGISLATION

An Act to authorize the Acquisition and Management of Grazing Lands.—This Act gives authority to the Minister of Agriculture to acquire by lease from the Government of Canada such public lands of the Dominion suitable for grazing as may be deemed necessary, as well as authority to purchase or lease lands of private individuals adjacent thereto.

The minister is also given power to establish as a community grazing area any lands so acquired, and oc-

cupiers of land in any such community grazing district who become members of an agricultural co-operative association organized within such district will be entitled to obtain a lease granting to the association the use of such grazing area in accordance with certain provisions.

Such an association leasing such grazing area is given power to have a lien upon animals pastured thereon. Provision is made with respect to the sale of animals for indebtedness.

An Act to Amend the Agricultural Co-operative Associations Act.—Provision is made that where an association desires to do a credit business the required by-law shall be signed by three-fourths of the shareholders residing within a thirty-five mile radius of the head office. A similar stipulation applies to the winding-up of an association.

Any association registered under the Act is required to use the words "Co-operative Association, Limited," as part of its name.

An Act to amend the Game Act.—Provides for the shooting of ducks by farmers whose crops are being damaged.

An Act to amend The Noxious Weeds Act.—This amendment is designed to assist rural municipalities in the eradication of weeds on public highways. It provides that where the council of a municipality has passed a by-law under The Rural Municipality Act, such by-law shall be in force in such municipality notwithstanding anything contained in The Noxious Weeds Act. This by-law provides that every owner or occupant of any parcel of land of which the whole or a part is cultivated or under crop shall be responsible for the destruction of noxious weeds found between such land and the middle of the adjoining road allowance.

The time within which amounts not paid for work performed under the Act may be added to the assessment of the lands is changed from January 1 to December 31.

An Act respecting Stock Yards and Live Stock Exchanges.—To give the force of law within the provinces of Saskatchewan to The Live Stock and Live Stock Products Act (Canada).

The amendments to The Horse Breeders' Act and The Saskatchewan Co-operative Creameries Act are of minor importance.

AGRICULTURAL APPROPRIATIONS

—	1922-23	1923-24
	$	$
Administration	60,196	53,666
Assistance to General Agricultural Interests	117,000	119,200
Assistance to Dairy Industry	31,000	36,500
Assistance to Live Stock Industry	62,300	56,100
Publicity and Statistical Work	22,500	18,700
Improvement and Protection of Field Crops	41,500	38,000
Game Protection and Museum	35,300	44,800
Co-operation and Markets	22,000	20,000
Debt Adjustment Bureau	....	11,300
Total	391,796	397,666

ALBERTA

AGRICULTURAL LEGISLATION

Agricultural Pests Act.—Provision is made for the supply of grasshopper poison bait free of charge to occupants of farm lands for the purpose of poisoning grasshoppers on roads, along irrigation ditches and upon waste or unoccupied parts of a town, city or village.

One half of the cost of poison bait ingredients, including freight to the distributing centre, will be charged to municipalities or residents of improvement districts.

The Community Grazing Act.—The province may accept from the Dominion Government leases of land for community grazing purposes. Notices of the availability of such leases shall be at once published in the Alberta Gazette giving a description of such area. Application for the use of this area for grazing purposes will be considered only when one-half of the residents of the district have signed a petition to the minister stating the number of stock they wish to graze. Upon receipt of such petition, the minister may declare the petitioners a community grazing association and shall appoint some person to call a meeting for the purpose of electing officers of the association. After organization, the minister may lease such area to the association upon terms to be agreed upon. The association may have a possessory lien upon all cattle grazing on such area for unpaid fees. The by-laws passed by the association shall be submitted to the minister for approval.

An Act was also passed respecting private grazing associations by which any ten farmers may petition the minister to incorporate them as a private grazing association.

An Act respecting Stock Yards.—An enabling Act to give force and effect of law to "The Live Stock and Live Stock Products Act, 1917" (Canada), in the province of Alberta.

The Mortgagees Seed Grain Security Act.—This Act provides that a mortgagee may advance seed grain or the purchase price of seed grain to a registered owner, mortgagor or the registered owner mortgagor and the purchaser of land under agreement of sale. The vendor of land who is also the registered owner may make a similar advance to the purchaser under an agreement of sale. Re-payment of amounts advanced may be secured by a seed grain lien. The amount advanced may be added to the principal sum due under mortgage or agreement of sale as the case may be and the amount of such lien shall be deemed to have formed part of the debt secured by the original mortgage or agreement of sale.

The Agricultural Societies Act.—The amendment to this Act reduces the amount to be paid in prizes, before earning a government grant, from $400 to $300, and provides a new schedule for computing the amount of the grant.

Stock Inspection Act.—Before driving stock from one point to another a distance of twenty miles or more within the province, or to a point beyond the province or to or from a forest reserve, notice must be sent to the Live Stock Commissioner or to the nearest police so as to be delivered prior to the movement of such stock. The person in charge of such stock must have in his possession a statement showing the brand, age, sex, and colour of the animals being driven.

No station agent shall accept stock for shipment which is not being shipped out of the province through Edmonton, Calgary, Moose Jaw or Winnipeg unless he has received a notice from the Live Stock Commissioner so to do or has a certificate from a stock inspector.

No person shall ship stock out of the province to or through Moose Jaw or Winnipeg unless he has sent to the Live Stock Commissioner the sum of ten cents per head for inspection, and no station agent shall accept for ship-

ment any stock out of the province to or through Moose Jaw or Winnipeg without proof of payment of the aforementioned fee.

Inspection and stamping of beef offered for sale in any city or town is no longer required.

The Domestic Animals Act.—Matters relating to stray animals, pounds, fences, entire animals, and sheep trailing are in unorganized districts retained under the control of the Minister of Agriculture, while in organized districts their administration is transferred to the jurisdiction of the Minister of Municipal Affairs.

APPROPRIATIONS

Agricultural Societies	$ 90,000 00
Official Judges and Extension	10,000 00
Production of Seed Grain	3,500 00
Live Stock Encouragement	20,000 00
Motion Picture Bureau	7,100 00
Stock Inspection	30,000 00
Brands recording	6,500 00
Stallion Act	5,000 00
Agricultural Statistics	5,400 00
Game protection	38,000 00
Promotion of Dairying	90,000 00
Schools of Agriculture—operation	84,450 00
School Fairs	7,500 00
Publicity	14,500 00
Poultry Industry	21,000 00
Women's Institutes	14,000 00
Miscellaneous grants	21,000 00
Agricultural Agents	25,000 00
Demonstration Farms—operation	30,400 00
Marketing	10,000 00
Registered seed grading and marketing	5,000 00
Miscellaneous	16,500 00
Total, chargeable to Income	$ 554,850 00
Total, chargeable to Capital	$ 632,270 00

NOVA SCOTIA

AGRICULTURAL APPROPRIATIONS

——	1922	1923
Current Account:		
Agricultural Societies	$ 20,000 00	$ 20,000 00
General Agriculture	49,441 66	50,000 00
College and Farm	44,309 79	42,073 32
Total	$ 113,751 45	$ 112,073 32
Capital Account:		
Agricultural College	$ 10,000 00	$ 13,900 00
Milk Collecting Station	....	2,700 00
Total	$ 10,000 00	$ 16,600 00

In addition to the foregoing, provision is made for an expenditure, not exceeding $25,000, for the encouragement of the production and use of ground limestone for agricultural purposes.

LEGISLATION

The following measures relating to agriculture were passed during the session of the Provincial Legislature for 1923:—

An Act Respecting Live Stock.—This enactment gives "The Live Stock and Live Stock Products Act, 1917" (Canada), and amendments and regulations, force of law in Nova Scotia. This Act legalizes work done by Dominion officials in Nova Scotia in respect to grading of live stock and various farm products.

An Act for the Encouragement of the Use of Ground Limestone for Agricultural Purposes in Nova Scotia.—Under the provision of this Act, a sum not exceeding $25,000 is appropriated to be used for assisting, by whatever means may be determined by the Lieutenant-Governor in Council, in making ground limestone more accessible to the farmers of Nova Scotia. Provision is made for possible assistance in either extending present limestone plants or the opening of new ones, for the prospecting for natural marl deposits, and in rendering them available. Temporary assistance in rebating freight on ground limestone up to an amount not exceeding one dollar per ton is authorized.

NEW BRUNSWICK

AGRICULTURAL LEGISLATION

Two measures of importance were passed at the 1923 session of the Legislature of New Brunswick. These are as follows:

The Farmers' Relief Act.—The Act empowers a municipality to borrow money for the purpose of lending same to farmers in such munici-

pality. The sum to be borrowed may not exceed 50 per cent of the total valuation of the real estate in the municipality and is repayable annually at 5 per cent interest.

The municipality availing itself of the provisions of the Act is required to appoint a Farm Loans Board, consisting of three persons, to whom are delegated all powers and duties arising out of the Act.

Loans are to be secured by first mortgage on farm land situated within the municipality, and are to be repaid on an amortization plan of not more than thirty equal annual instalments at a rate of interest sufficient to pay the interest on the sum borrowed by the municipality but in no case to exceed six per cent.

The purpose for which loans may be made are as follows:

(*a*) To discharge liabilities incurred for the improvement and development of land used for agricultural purposes, and any purpose calculated to increase land productiveness;

(*b*) To acquire land for agricultural purposes and the satisfaction of encumbrances on land used for such purposes;

(*c*) To clear and drain land for agricultural purposes;

(*d*) To erect farm buildings;

(*e*) To purchase live stock and implements.

Addition to the Dairy Industry Act.—Contains provisions for the testing for butter fat of milk and cream supplied to dairy factories; the retaining of samples; the keeping of daily records of tests, amounts of milk or cream received; the weight of butter and cheese manufactured and of the disposal of same; and gives patrons and official inspectors access to said records. Inspectors are empowered to take samples for testing, either at the farm or elsewhere, and to re-test samples Where a re-test is demanded, the inspector's test shall be final, and shall determine the rate of payment.

APPROPRIATIONS

The appropriations for the New Brunswick Department of Agriculture are as follows:—

—	1922	1923
General	$ 71,250 00	$ 78 150 00
Exhibitions	18 000 00	18,000 00
Total.	$ 89,250 00	$ 96,150 00

BRITISH COLUMBIA

AGRICULTURAL LEGISLATION, 1922

An Act to amend the Pound District Act.—Where payment is made out of the Consolidated Revenue Fund to a pound-keeper pursuant to this Act for fees or expenses incurred in respect of any impounded animal, the Minister of Finance may recover the amount so paid from the owner of the impounded animal by action in any court as for a debt due to the Crown.

An Act to provide for the Control of the Codling Moth.—In response to a call for further help by orchardists in the Okanagan Valley in connection with the control of codling moth, which in spite of ordinary control measures was showing a tendency to increase, the Government of the Province decided to effect legislation which would enable a special sum of money not exceeding $20,000 in any one year to be provided in addition to other votes for the extermination of this pest. The Act gives authority for employees of the Department to enter upon any lands, without the consent of the owner, within a district that has been proclaimed a codling moth control area. The expenditures of all such special sums advanced is under the control of the Department of Agriculture, and in connection with the repayment of

such sums, the Act gives authority for the assessing and levying of a tax on all fruit lands within such areas. The valuation of the fruit trees is determined by the Provincial Assessor who makes a fair apportionment.

Provision is also made for cases where a codling moth area comes within a municipal district or where lands are owned by a municipal corporation.

An Act to amend the Co-operative Associations Act.—A number of alterations were made to the various clauses of the Act, which was passed in 1920, the most important being the following:—

Clubs.—Where an association has been formed for the purposes of a club, evidence may be required that such club has been carried on in a proper manner for at least one year immediately preceding the application for incorporation.

Apportionment of Profits.—In addition to the provisions in the main Act relating to setting aside not less than ten per cent of the profits as a reserve fund and the payment of dividends not exceeding eight per cent. the following clause was made effective:—

> "(*c*) By distributing among such patrons or such class or classes of its patrons as the association may, subject to its rules, determine, whether members or not, and whether vendors to or purchasers from the association, the whole or any portion of its remaining profits."

Enforcement of Contracts.—The following important amendment to the Act was passed owing to representations made by the fruit growing industry:—

> "19A. Where a person enters or has entered into a contract with an association to deliver to or sell through the association any agricultural or manufactured product grown or made by him, or on his behalf, or in which he has an interest, such person being one of a number of persons with whom the association makes or has made contracts of like nature, any such contract may be enforced by an order for specific performance."

An Act to amend the Societies Act.—The Societies Act, passed in 1920, is the Act under which all Farmers' and Women's Institutes, Agricultural Associations and, in general, non-share capital associations are incorporated. A number of minor amendments were passed clearing up points in connection with the procedure of incorporation of associations under the Act.

An Act to amend The Trespass Act.—Clause 3, giving definitions of a legal fence, is amended by provision being made for Orders in Council to be passed suspending the operation of the various definitions of a legal fence in unorganized territory in that portion of the Fort George electoral district lying east of the summit of the Rocky Mountains. Provision is also made for what shall constitute a lawful fence for any purpose within the said area.

AGRICULTURAL APPROPRIATIONS

——	1922-23	1923-24
Minister's Office . .	$ 13,190 00	$ 13,190 00
General Office	38,176 00	37,426 00
Horticultural Branch....	104,712 00	115,762 00
Live Stock Branch. ...	67,472 00	84,992 00
Statistics	4,520 00	4,320 00
District Agriculturists, etc	16,270 00	.. .. ..
Workshop and Shipping Office	3,180 00	3,180 00
Miscellaneous Grants, etc	132,150 00	124,500 00
Total....	$ 379,670 00	$ 383,370 00

PART III

Agricultural Education and Related Activities

HIGH SCHOOL AGRICULTURE IN ALBERTA

By G. V. VAN TAUSK, M.A., B.Sc., (Ag. Ed.)

The Past

THE development of Agriculture as a school subject in both the Elementary and High Schools is described in an article by the author on page 145 of Volume X, No. 2, (March-April, 1923), of The Agricultural Gazette.

From the inception of the Province until 1915, agriculture was taught more or less in connection with Botany and as a text-book subject. A new course in High School Agriculture was introduced in 1915. This course, with little change, is still in effect. It contained the following topics:—

1. Soil—origin and physics;
2. Elementary Soil Chemistry;
3. Preparation of Seed Bed;
4. Plant Propagation;
5. Bacteria as Related to Soil;
6. Weeds;
7. Seeds;
8. Plot Work;
9. The economic Value of Plants;
10. Birds, Insects, etc.;
11. Animal Husbandry.

Judging from the following Inspectors' reports, this new course did little or nothing towards improving the work in High School Agriculture.

(1) "The teaching of Agriculture is not very effective, due to lack of experimental work. A properly organized course in Secondary Agriculture should be primarily and fundamentally a series of laboratory and field experiments around which recitations, lectures and reading will centre as supplementary work. In the majority of the schools visited very little laboratory or field work was attempted."

(2) "A differentiation in the content of the course in Agriculture for urban and rural schools might be made. At present the work in this subject in the city schools is quite theoretical, while in the rural schools, through lack of time, this phase of the work is not emphasized and given the helpful practical turn of which it is capable. To do this subject justice, instruction should be given by persons with special qualifications."

The Present

Agriculture is being taught as a science option in the third year of the High School course, and in most instances is merely a matter of memorizing notes or book material. This is due to the following factors:—

(*a*) Lack of teachers with special Agricultural training;

(*b*) The subject being new has not been organized like the older sciences;

(*c*) Lack of sympathy on the part of school officials and authorities;

(d) Lack of understanding of the fact that Agriculture is not only a science, but also an art, business and mode of living, and that all these are so closely related that for the purpose of instruction they have to be considered one whole.

(1) High School Inspector J. A. Smith, in Report of Dept. of Education, Alberta, for 1919, Page 17.

(2) High School Inspector G. A. McKee, in Report of Dept. of Education, Alberta, for 1920, Page 25.

It was pointed out at the 1922 Convention of the Canadian Society of Technical Agriculturists, that Alberta is the last of the provinces in regard to School Agriculture. The explanation is: that in Alberta no appropriation is made from the "Agricultural Instruction Act" or from provincial funds towards furthering Agriculture as a school subject, and also that this is the only province in the Dominion that has no Governmental Branch, or at least an official, in charge of Rural Science or School Agriculture.

The Future

A new course of study for the High Schools is in preparation. The following courses are being outlined, viz:—Normal Entrance, Matriculation, Agricultural, Commercial, Technical and General.

Agriculture is an optional science subject in the Normal Entrance, Matriculation (not definitely decided), and General Courses It is obligatory in the Agricultural Course.

"Agriculture is to be offered for two years. The courses in Agriculture are inter-related in such a way that the student who selects the first year of Agriculture (offered in the second year of the High School course) must select the second course in the following year. Project work is to be undertaken in the spring at the end of the first year, and it is provided that a portion of the work of the following autumn will be based on the results obtained in these projects." In the first year of the course the scientific principles underlying agricultural practice and some related botany, entomology, and soil physics are treated. The second year's work is pre-eminently an application of the above to agricultural practice and animal husbandry.

The aim of the teaching of Agriculture in Alberta High Schools is:

(1) To teach a subject with the same purpose and end in view as Physics and Chemistry;

(2) To develop in the pupil an interest and intelligent appreciation of Canada's primary industry;

(3) To teach the student through the subject matter and the method of instruction of the course in Agriculture the three main functions of Secondary Education,—

*(*a*) "To prepare the individual for efficient participation in the duties of social, civil, political, and family life;

(*b*) "To prepare the student to become an efficient, economic factor;

(*c*) "To prepare the student for the activities whose primary purposes are personal development and personal happiness through the correct use of his leisure time."

*From the Second Interim Report of the Committee on High School Education, Edmonton, March 1, 1923

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

THE LATE JOHN G. RUTHERFORD

DR. J. G. RUTHERFORD, C.M.G., D.V.S., member of the Board of Railway Commissioners for Canada, and formerly Veterinary Director-General and Live Stock Commissioner, died suddenly at St. Luke's Hospital, Ottawa, on July 24, in his 66th year.

Dr. Rutherford was exceptionally well informed on Canadian agricultural matters, and on the live stock industry in particular, and his contribution to the betterment of cattle and horse breeding in Canada was outstanding. He was virtually the author of the Grain Act, and while in Parliament, from 1897 to 1900, was prominent in advocating the instituting of a Dominion Board of Railway Commissioners.

John Gunion Rutherford, C.M.G., V.S., H.A.R.C.V.S., was born at Mountain Cross, Peebleshire, Scotland, on Christmas Day, 1857, the son of Rev. Robert Rutherford, M.S., a prominent minister of the Scottish church. He migrated to Canada at the age of 17, and attended the Ontario Agricultural College, Guelph, being one of the earliest students at that institution.

In 1879, he was graduated from the Ontario Veterinary College and was the winner of the gold class medal. Following his graduation, he practised his profession with success for many years at various places in Canada, the United States and Mexico. In 1884, Dr. Rutherford settled at Portage la Prairie, Manitoba, where he engaged in veterinary practice and specialized in horse breeding and live stock.

His first appointment to public office came in 1884, when he was made provincial veterinary inspector for Manitoba. He resigned from this office in 1892 to enter politics and successfully contested Lakeside (Portage Plains) for the Manitoba Legislature. After serving four years in the Legislature he decided to enter the Federal arena, and was returned in a by-election in Macdonald, 1897. The riding then comprised more than one-sixth of Manitoba.

After acting as special quarantine officer for the Federal Department of Agriculture in Great Britain during 1901, Dr. Rutherford was, the following year, appointed chief veterinary inspector.

In 1904, he organized the Health of Animals Branch, becoming Veterinary Director-General. In 1906, he was made Dominion Live Stock Commissioner. He held both offices until 1912, and during his tenure the work of two branches was brought into close correlation.

While Dr. Rutherford was in office, many original and radical departures were made in connection with the control and eradication of contagious diseases among the live stock of the Dominion, one of the most important of these being the creation of a Pathological Division and the establishment of a Biological Laboratory.

In recognition of his services to Canada and the Empire, Dr. Rutherford was in 1910 created a C.M.G.

Upon leaving the Government service in 1912 he undertook a campaign for the encouragement of mixed farming and the development of the live stock industry in the Western Provinces, under the auspices of the Canadian Pacific Railway.

From 1913 to 1919, Dr. Rutherford served as president of the Western Canada Live Stock Union, one of the largest organizations in Canada interested in production of live stock.

He represented Canada at the International Institute of Agriculture held at Rome and the International Congress on Tuberculosis at Washington, D.C., in 1908. He was president of the American Veterinary Medical Association from 1908 to 1911, and chairman of the International Commission on the Control of Bovine Tuberculosis.

Dr. Rutherford was largely instrumental in bringing about far-reaching improvement in veterinary education in Canada.

Among the many posts Dr. Rutherford held was that of Chairman of the Reindeer Commission. He made a report to the Canadian Government on the commercial possibilities of reindeer raising and the marketing of the meat.

Dr. Rutherford did some extensive farming on his own account, his farm being situated in the Chilliwack Valley, British Columbia.

REGULATIONS FOR THE GRADING AND MARKING OF EGGS EXTENDED TO DOMESTIC TRADE

THE Federal regulations regarding the grading and marking of eggs, which came into effect on July 7, 1923, provide that all eggs for domestic consumption in Canada shall be graded and classified according to the Canadian Standards, and that every case or container of eggs for sale must be marked on both ends with the name and class of eggs contained therein. This provision applied previously only to import, export and interprovincial trade.

The main provisions of the new regulations are as follows:—

4. Every case or container of eggs that is shipped or delivered by persons who receive eggs on consignment or buy eggs for re-sale shall be marked, labelled or tagged in conspicuous letters on both ends with the name of the class and grade of the eggs contained therein, according to the Canadian Standards, providing that any producer or other person dealing in eggs may delegate his right to candle and grade to the first wholesaler or retail dealer to whom the eggs are shipped or delivered, in which case the markings, labellings or taggings shall consist of the words "Ungraded Eggs for Shipment Only." and provided that the provisions of this regulation shall not apply to shipments or deliveries direct from producer to consumer. When cartons are packed in cases or other containers, both cases and cartons shall be marked, labelled or tagged as aforesaid.

5. Every case or container of eggs that is exposed, displayed or offered for sale by any person selling or delivering eggs direct to consumers in a public place or manner shall be marked, labelled, tagged or accompanied in conspicuous letters with the name of the class and grade of eggs contained therein.

6. Cases or containers of eggs marked with the name of the class and grade shall be considered to be properly marked when they contain not more than an average of six and one-half (6½) per cent below grade stated apart from breakage. Com-

plaints to vendors, with respect to eggs below grade, shall be made to the vendor within 24 hours of the receipt of such eggs. After the expiration of the said 24 hours the liability as to eggs below grade stated shall be upon the person in whose possession such eggs are found.

7. Every person who sells, offers or displays eggs for sale as a retailer shall cause to be displayed in a prominent place in his place of business a card as may be prescribed setting forth classes and grades of eggs as defined by the Canadian standards.

8. No person shall ship eggs or cause eggs to be shipped or delivered or displayed for sale in cases or containers which are marked or labelled or tagged with the name of any class or grade specified in these Regulations unless the quality and weight of the eggs contained therein is equal to or better than such class and grade.

9. No person shall buy for sale or re-sale, or expose, offer for sale, or sell eggs which are unfit for human food.

10. (1) All persons who receive eggs on consignment or buy eggs for re-sale, in making payment for same, shall apportion the returns on the basis of Canadian standard grades accompanied by a statement on forms as required in schedule "A" to these Regulations, provided that this Regulation shall not apply where producers market their eggs in less than fifteen dozen lots in any one day.

(2) A consignee of ungraded eggs transferring the same to another party for candling and grading shall make the transfer within 48 hours from the time the eggs are delivered to the consignee.

(3) The Minister, or his representative, may require to be notified in the case of a transfer for the purpose of candling and grading as mentioned in the next preceding subsection, and may prescribe the conditions under which such transfers may be made.

11. Any inspector charged with the enforcement of these regulations may enter any premises or conveyance to make examination of any case or container of eggs suspected of being improperly or falsely marked in violation of the provisions of these Regulations or to ascertain the manner and extent to which the returns for eggs have been apportioned in accordance with the Canadian standards as required in regulation 10 of these regulations.

AMENDMENTS TO THE REGULATIONS UNDER THE DESTRUCTIVE INSECT AND PEST ACT

Amendment No. 19 (No. 2 of 1923)

By Order in Council passed on May 31, 1923 (P.C. 999), the amendment dealing with the European Corn Borer passed on March 21, 1922, under subsection (*h*) of section 7 of the Regulations was rescinded and the following substituted therefor:—

Section 7.—The importation into Canada of the following is prohibited:—

(*h*) Corn and broom corn (including all parts of the plant), all sorghums, sudan grass, cut flowers or entire plants of chrysanthemum, aster, cosmos, zinnia, hollyhock, and cut flowers or entire plants of gladiolus and dahlia except the bulbs thereof without stems, oat and rye straw as such or when used for packing, celery, green beans in the pod, beets with tops, spinach, and rhubarb,

from the following counties in eight states of the United States of America:—

Maine:—Cumberland and York counties;

Massachusetts:—Barnstable, Bristol, Essex, Middlesex, Norfolk, Plymouth, Suffolk and Worchester counties;

Michigan:—Munroe and Wayne counties;

New Hampshire:—Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham and Strafford counties;

New York (Eastern):—Albany, Fulton, Greene, Hamilton, Montgomery, Otsego, Renssalaer, Saratoga, Schenectady, Scoharie, Warren and Washington counties;

New York (Western):—Cattaragus, Chautauqua, Erie, Genesee, Niagara and Wyoming counties;

Ohio:—Ashtabula, Cayahoga, Erie, Geauga, Lake Lorain, Lucas, Ottawa, Sandusky and Wood counties;

Pennsylvania:—Crawford and Erie counties;

Rhode Island:—Bristol, Newport and Providence counties;

unless the same are accompanied by a certificate of inspection issued by an authorized officer of the United States Department of Agriculture, which states that the shipment is free from infestation by the European Corn Borer.

This prohibition does not apply to the plants enumerated when they shall have been manufactured or processed in such a manner as to eliminate all risk of carriage of the European Corn Borer, nor to cleaned shelled corn nor to cleaned seed of broom corn.

Amendment No. 20 (No. 3 of 1923)

By Order in Council dated June 4, 1923 (P.C. 1000), the amendment to the Regulations dealing with the importation of certain species of Berberis, passed on April 19, 1919, as subsection (*g*) of section 7 of the Regulations was rescinded and the following substituted therefor:—

Section 7.—The importation into Canada of the following is prohibited:—

(*g*) European Buckthorn *(Rhamnus cathartica L.)* and common or Rust Barberry *(Berberis Vulgaris L.)* and their hybrids and horticultural varieties: all species and varieties of *Berberis* and *Odostemon (Mahonia)* susceptible to Crown Rust of Oats and Black-stem Rust of Wheat respectively: including:—

B. Amurensis Rupr.
B. Canadensis Pursh.
B. Lycium Royle.
B. Sibirica Pall.
B. aristata D.C.
B. ilicifolia Forst.
B. Nepalensis Spreng.
O. Aquilfolium Rydb."

The only change in this regulation is that European Buckthorn *(Rhamnus cathartica L.)* has been added to the list of plants prohibited entry on account of its being a host of the disease causing Crown Rust of Oats.

Amendment No. 21 (No. 4 of 1923)

By Order in Council dated June 4, 1923 (P.C. 1001), the amendment dealing with the importation into the Prairie Provinces and eradication therein of certain species of *Berberis*, passed on April 19, 1919 as subsection (*a*) of section 12 of the Regulations, was rescinded and the following substituted therefor:—

(*a*) European Buckthorn *(Rhamnus cathartica L.)* and the following species, hybrids and horticultural

varieties of the genera *Berberis* and *Odostemon* (Mahonia), including:—

B. Vulgaris L.
B. Amurensis Rupr.
B. Canadensis Pursh.
B. Lycium Royle.
B. Sibirica Pall.
B. aristata D.C.
B. ilicifolia Forst.
B. Nepalensis Spreng.
O. Aquifolium Rydb.

constituting an obstacle to the successful control of Crown Rust of Oats and Black stem Rust of Wheat respectively, shall, therefore, be prohibited from being moved from any area outside to any area within the Provinces of Manitoba, Saskatchewan and Alberta, throughout which provinces they shall be exterminated without any claim for compensation."

The only change in this Regulation is the addition of European Buckthorn *(Rhamnus cathartica L.)* which constitutes an obstacle to the successful control of Crown Rust of Oats.

THE POWDERED MILK INDUSTRY

By B. A. GOULD, President, Canadian Milk Products, Limited

THE first commercial manufacture of milk powder in Canada was at Brownsville, Ontario, in the spring of 1904. The process used was the hot roller process, which is now becoming somewhat obsolete. The product was entirely unknown and lacked some of the valuable qualities of modern process powders, such as complete solubility, etc. The growth of the use of milk powder in Canada was therefore very gradual, and a small production was all that could be successfully marketed.

The first modern spray-process powder was also made at Brownsville in 1909, when the original plant was remodelled for this purpose. The advantages of the powder produced by this process were such that its use has grown rapidly. To-day there are ten producing plants in Canada making powdered milk of various kinds. The greater part is skimmed milk powder; but there are also considerable amounts of whole milk powder and of cream powder manufactured, as well as special kinds of powder, such as modified milk powder, protein milk powder, and ice cream powder. It is estimated that, during the current year, more than one hundred million pounds of Canadian milk will be marketed in the form of powder.

The future of the industry in Canada is very bright, but only those manufacturers who have up-to-date methods and assured capital, as well as good selling organizations, are likely to succeed. A great deal of work must still be done to get the milk produced on the farms of the quality necessary to yield a first-class product. It is not enough to have modern sanitary equipment at the manufacturing plants, but the equipment and the methods of the producing farms must also be up-to-date or the product will not be of the highest quality. Much harm has been done to the industry by the marketing of inferior powdered milk, and it is only by expensive experience that buyers have learned that milk powders of the same chemical analysis may nevertheless vary greatly in value.

This industry will become one of rapidly growing value to Canada if the manufacturers are able to keep the quality of their product second to none. The home market is capable of further development, and foreign markets are open for the right kind of powder.

EXPORT PROSPECTS FOR CANADIAN REGISTERED SEED

A recent development in connection with Canada's export seed trade is the shipment to Argentina of 500 bushels of Registered Marquis wheat. This wheat was the product of Saskatchewan members of the Canadian Seed Growers' Association, and the shipment was the first of its kind to go to South America in commercial quantity. The results will be observed by the representatives of the Commercial Intelligence Service of the Department of Trade and Commerce, and should the performance of the seed prove to be satisfactory, further purchases from Canada may be looked for.

On account of Canada's northern latitude and rigorous climatic conditions, combined with immense tracts of rich virgin soil, Canadian-grown seed of any given kind or variety, when planted in southern latitudes, is known to yield a bigger crop of better quality than does seed of the same kind or variety produced in a southern latitude. Of recent years this fact has been taken advantage of by potato growers in the South Atlantic States. These growers usually obtain a large portion of their seed potatoes from New Brunswick and Prince Edward Island. Similarly, grain growers and seed firms from the south of the Canadian boundary look to the prairie provinces of Canada for much of their high-class seed grain supply.

Productivity, purity and vitality are the essentials of good seed. To guarantee these qualities in the seed produced by its membership, is the work of the Canadian Seed Growers' Association, an organization which for twenty years has been engaged in educational and control work. Through this organization, promising strains of various kinds have been pedigreed, multiplied, and kept pure. Only varieties of proved merit are accepted for registration, seed fields are carefully inspected, and the product, after being tested for purity and germination, is graded, marked and sealed at the grower's premises or at a central cleaning plant. In addition, the kind, quality and source of eligible seed stock is recorded each year, so that information is always available as to where supplies may be obtained.

By these means the Association is doing work that is vital to the interest of Canadian agriculture, and the promising export business which is apparently developing will be greatly assisted. Arrangements are now being made, according to the Secretary, Mr. P. Stewart, of Ottawa, for greater volume of production of seed grain in the Canadian West, in order to meet home requirements and foreign demand for seed of this class.

A NEW SOURCE OF CLOVER SEED

AT a meeting of representatives of the Dominion Department of Agriculture, the Canadian Seed Growers' Association and of the Ontario Department of Agriculture, recently held at Oxdrift in the Dryden District of Northern Ontario, a plan was formulated for a system of inspection and scoring of clover seed fields this season. The meeting was called by the Co-operative Association of Seed Growers at Oxdrift, an organization consisting of seventy active members. This association cleaned and sold for Canadian consumption upwards of $30,000 of clover seed last year.

Selected fields of clover seed growers in the Dryden District will be inspected and scored on the basis of:

(*a*) Origin and apparent hardiness of seed planted;
(*b*) Hay yielding capacity;
(*c*) Seed yielding capacity;
(*d*) Freedom from disease, impurities and weeds.

The seed of approved stock will be kept separate and placed on the market under the seal and certificate of the Canadian Seed Growers' Association. This move, it is expected, will provide a promising field for the seed growers in New Ontario, as well as valuable assistance to farmers who wish to purchase native-grown clover seed of the highest grade. The possibilities of development in clover seed production are seen in the fact that tremendous quantities of clover seed are imported into Canada each year. The importation for the past fiscal year amounted to 8,393,470 pounds, valued at one and three-quarter millions of dollars. Like all other northern-grown seed, the New Ontario clover seed produces infinitely better results on Canadian farms than seed imported from warmer climates.

NEWS ITEMS AND NOTES

The Hon. John S. Martin, B.A., South Norfolk, Minister of Agriculture for the province of Ontario in the Ferguson government, owns and operates a 200 acre farm near Port Dover, and has achieved a wide reputation as a breeder and exhibitor of White Wyandotte fowls. After graduating from the University of Toronto, he was a high school principal for a number of years. Mr. Martin has been prominent in municipal affairs.

The Agricultural Representative is one of the chief connecting links between departments charged with the development of scientific agriculture and the farmer. He acts as a resident agent, studying local requirements and transmitting information on approved agricultural practices ascertained by means of experimental work. As a promotion agent he is especially useful. This has been demonstrated by his work, not only among the adult farm population, but also among adolescents through the medium of school fairs, boys' and girls' clubs, classes of instruction for farm boys, stock-judging teams, and competitions of various kinds.

At the sixteenth annual convention of the Agricultural Representatives of the Ontario Department of Agriculture held at the Ontario Agricultural College in June last there was an attendance of fifty representatives and ten assistants. All phases of agricultural extension work were discussed, as well as matters relating to the general activities of the representatives. The College professors, representatives from the Ontario and Dominion Departments of Agriculture, and several leaders in the extension work of the United States, took part in the proceedings. R. S. Duncan, Director of Agricultural Representatives was the general chairman, and was assisted by W. D. Jackson, Assistant Director. The convention lasted for over three days.

At the 1923 conference of Ontario Agricultural Representatives, Mr. H. H. Dean, Professor of Dairying at the Ontario Agricultural College, stated that his department had definitely proved that milk rich in butter-fat produces more and better cheese than low-testing milk. Milk testing 3·7 per cent fat, for example, produced 11 pounds more cheese per 1,000 pounds of milk than milk testing 3·2 per cent.

In order to introduce the methods so successfully used in British Columbia for the packing of fruits for long distance shipments, the Fruit Branch of the Dominion Department of Agriculture has arranged to bring an expert packer from British Columbia to Ontario. Demonstrations in the packing of fruit in western packages are being given throughout the tender fruit sections of the province.

It will be of special interest to French readers to know that Rev. Fr. Wilfrid, superintendent of the Poultry Division at the Oka Agricultural Institute, has published a third edition (completely revised) of his bulletin on poultry-keeping. This bulletin, No. 4, is entitled "Twenty Years of Practice and Experiment With Poultry;" it comprises 175 pages, contains many illustrations, and also four coloured cuts showing

how to tell good layers from poor ones. Prepared with the utmost care and its printing being all that could be desired, this bulletin—the result of 20 years' work—will no doubt be welcomed as a recognized guide for all those engaged in poultry work in the province of Quebec. It is distributed free of charge by the Publications Branch of the Quebec Department of Agriculture.

Mr. A. H. White, B.S.A. (Guelph, 1917), Senior Dairy Promoter, Dominion Dairy and Cold Storage Branch, has received a Master of Science degree from the Iowa State Agricultural College at Ames. Mr. White, who took a nine months' post graduate course in dairy manufacturing, was successful in securing one of the four teaching fellowships in dairying offered each year at that institution. Seven Canadians took post graduate work at Ames during last year in dairying and animal husbandry, including Professor Wade Toole, of the Ontario Agricultural College, Guelph, who received his master's degree in March. There were also a number of South African students in attendance, taking either graduate or undergraduate work. The South African Government, Mr. White states, grants financial assistance amounting to about $1,000 a year to such students, subject to their remaining in the government service for three years on their return.

The professor of poultry husbandry of the Manitoba Agricultural College, Mr. M. C. Herner, has issued a statement as to the results obtained recently in the culling of poor layers in farm flocks of chickens in that province. In many flocks nearly half of the hens have been culled out, and the good ones left laid almost as many eggs as the whole flock laid before culling. In one district 13 flocks were culled, comprising 846 hens, of these 374 were eliminated, and the 472 remaining laid 1,378 eggs in 7 days after culling, as compared with 1,456 from the whole flock in the week previous to culling.

The fifth of the egg laying contests conducted by the Dominion Experimental Farms begins on November 1, 1923. The contests will be conducted as usual at the Central Experimental Farm, Ottawa, and at one experimental farm or station in each of the provinces, and run for 52 consecutive weeks. Birds qualifying are eligible for registration in the Canadian National Poultry Record.

The organization recently of a seed-grain cleaning, grading and marketing service by the Alberta Department of Agriculture is showing important results. Its cleaning plant, which is equipped with machinery of the latest type, was operated during part of last season. A reasonable price was quoted for the seed, and the demand for it was good. The undertaking will doubtless promote and encourage the development of pure seed growing in the province.

Because of a decrease in attendance, the Alberta Department of Agriculture will close for the time being four of the six Alberta Schools of Agriculture. The Schools at Olds and Claresholm will be continued.

According to figures supplied by the Dominion Bureau of Statistics, the production of commercial apples in Canada was 3,334,660 barrels in 1919, 3,404,340 in 1920 and 4,046,813 in 1921.

The exports were as follows:—

—	Quantity	Value
	Brls.	$
1919-20 ...	873,882	4,242,219
1920-21 ..	1,358,499	8,299,099
1921-22..	1,845,955	8,854,379
1922-23	1,460,656	6,450,044

The principal countries importing Canadian apples are the United Kingdom, the United States and Newfoundland. Small quantities are exported to a surprisingly large number of other countries, including New Zealand, Cuba, the West Indies, Central and South American countries, South Africa, and even China.

In 1922-23 the United Kingdom took 1,325,658 barrels, compared with 1,523,901 in 1909-10, indicating that exports to that country are steadily approaching pre-war levels. The United States received 71,744 barrels in 1922-23 compared with 48,272 barrels in 1910.

Dr. J. H. Grisdale, Deputy Minister of Agriculture, and Mr. Duncan Marshall, Commissioner of Agriculture, will form part of the Canadian delegation to the Imperial Economic Conference in London in October, where the various problems arising from the removal of the cattle embargo are expected to come up for discussion. The matters to be discussed will include the regulations in regard to store cattle and also the admission of breeding animals.

Arrangements have been completed for a government exhibit of fruit at the Imperial Fruit Show to be held in Manchester, England, during the week commencing October 26. Canada is to be represented on the board of judges, which will consist of three, one from Great Britain, one from Canada, and a neutral judge.

APPOINTMENTS AND STAFF CHANGES

Mr. Lionel Stevenson, who has been Secretary and Supervising Director of the Ontario Department of Agriculture for the past two or three years, with headquarters at Toronto, has been appointed Director of Extension, Ontario Agricultural College, with headquarters at Guelph.

Mr. Stevenson's work will include the supervision of the outside activities of the officers of the College and of the Department, with the object of increasing their usefulness to the farmers.

J. A. Neilson, B.S.A., M.S., until recently lecturer in horticulture at the Ontario Agricultural College, has been appointed to the Horticultural Experiment Station staff at Vineland in the capacity of extension horticulturist.

Mr. William Alfred Maw, B.S.A., has been appointed to succeed Dr. M. A. Jull as Manager and Lecturer in the Poultry Department, Macdonald College. Mr. Maw received his B.S.A. from McGill University on May 28, 1920, having specialized in poultry husbandry. He took post-graduate work at Cornell last year.

ASSOCIATIONS AND SOCIETIES

Canadian Society of Technical Agriculturists.—The Canadian Society of Technical Agriculturists held its third annual convention at the University of Saskatchewan, Saskatoon, in June, 1923. A report of the proceedings is published in the Society's journal, *Scientific Agriculture*.

Resolutions were passed recommending (1) That the Dominion government enact at the next session of Parliament such legislation as will ensure to the Provinces continued and generous financial support towards the furtherance of agricultural instruction; (2) That the Federal and Provincial governments provide additional facilities for research in veterinary medicine.

The Society conferred a Fellowship upon Dr. James W. Robertson, of Ottawa, for professional distinction.

The committee on Graduate Scholarships recommended that the scholarship donated by the society for post-graduate work, be awarded to Mr. W. F. Hanna, B.A., B.Sc.A., M.Sc. Mr. Hanna will take graduate work in plant mycology and physiology at the University of Manitoba.

It was agreed to hold the 1924 convention at the Ontario Agricultural College, Guelph, The society's officers for 1923-24 were published in the previous issue of The Agricultural Gazette.

Alberta Co-operative League.—President, A. Litt, Bentley; Vice-president, F. Freeman, Wetaskiwin; Secretary, A. P. Moan, Wetaskiwin.

Federated Women's Institutes of Canada.—President, Mrs. David Watt, Birtle, Man.; Recording Secretary, Mrs. H. A. H. Rogers, Fort Saskatchewan, Alta.; Corresponding Secretary, Mrs. P. H. Speechly, Winnipeg; Publicity Secretary, Mrs. J. F. Price, Calgary, Alta.; Treasurer, Miss Annie Pritchard, Wyman, Que.

The Fraser Valley Milk Producers' Association.—President and General Manager, W. J. Park, Vancouver, B.C. This association is among the most successful co-operative organizations of producers in Canada engaged in the distribution and sale of milk, cream and the manufacture and sale of butter. The organization handles the milk of 85 per cent of the Fraser Valley producers, and is supplying milk to the residents of the city of Vancouver at the rate of 7,000 gallons per day. Its milk, containing four per cent butter fat, finds a ready sale.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Illustration Stations, British Columbia, Alberta and Saskatchewan, 1922.—Report of the Chief Supervisor, J. Fixter, Dominion Experimental Farms.

Illustration Stations, Quebec, New Brunswick and Nova Scotia, 1922.—Report of the Chief Supervisor, J. Fixter. Dominion Experimental Farms.

Experimental Station, Invermere, B.C., 1922.—Report of the Superintendent, R. G Newton, B.S.A. Dominion Experimental Farms.

Experimental Station, Charlottetown, P.E.I., 1922.—Report of the Superintendent, J. A. Clark, B.S.A. Dominion Experiment 1 Farms.

Experimental Station, Swift Current, Sask., 1922.—Report of the Superintendent, J. G. Taggart, B.S.A. Dominion Experimental Farms.

Experimental Station, Morden, Man., 1922.—Report of the Superintendent, W. R. Leslie, B.S.A. Dominion Experimental Farms.

Experimental Station, Lacombe, Alta., 1922.—Report of the Superintendent, F. H. Reed, B.S.A. Dominion Experimental Farms.

Cereal Division.—Report of the Dominion Cerealist, L. H. Newman, B.S.A., for the year 1922. Dominion Experimental Farms.

Bee Division.—Report of the Dominion Apiarist, C. B. Gooderham, B.S.A., for the year 1922. Dominion Experimental Farms.

Silage and Silo Construction for the Maritime Provinces.—By J. A. Clark, B.S.A., Superintendent, Experimental Station, Charlottetown, P.E.I. Pamphlet No. 35—New Series. Experimental Farms Branch.

ONTARIO

Women's Institutes of the Province of Ontario.—Report, 1922.

Horticultural Societies, 1922.—Seventeenth Annual Report.

Ontario Vegetable Growers' Association, 1922.—Eighteenth Annual Report.

QUEBEC

Constructions de Ferme.—By L. Philippe Roy, B.S.A., Chief, Field Husbandry Division. Bulletin No. 80.

Société d'Industrie Laitière et de l'Ecole de Laitèrie.—Forty-first Annual Report, 1922. Supplement to the Report of the Minister of Agriculture.

Mérite Agricole, 1922.—Thirty-third Annual Meeting. Supplement to the Report of the Minister of Agriculture.

Le Paiement du Lait d'après sa richesse en matière grasse.—By M. Omer Tessier. Circulaire 69.

Pomological and Fruit Growing Society, 1922.—Annual Meeting. Supplement to the report of the Minister of Agriculture.

Twenty Years of Practice and Experiment with Poultry. A review of poultry-keeping, especially adapted to conditions in the Province of Quebec. 3rd Edition. Revised and enlarged by the Superintendent of the Poultry Division, Oka Agricultural Institute. Bulletin No. 4.

SASKATCHEWAN

The Beef Ring.—Bulletin No. 73. Co-operation and Markets Branch.

ALBERTA

Annual Report of the Department of Agriculture of the Province of Alberta for the year 1922.

BRITISH COLUMBIA

Poultry Farm Survey, 1921.—A Report on Sixty-five Commercial Poultry Farms in the Lower Fraser Valley and Vancouver Island. Agricultural Department Circular No. 41. Department of Poultry Husbandry, College of Agriculture, University of British Columbia, Vancouver. College of Agriculture Circular No. 7.

NOVA SCOTIA

The European Apple Sucker.—Bulletin No. 10. By W. H. Brittain, Provincial Entomologist.

NEW BRUNSWICK

Proceedings of the Acadian Entomological Society for 1922. No. 8. (Formerly Entomoligical Society of Nova Scotia).

MISCELLANEOUS

The Canadian Ayrshire Herd Book.—Volume 32. Containing pedigrees 78451 to 82700. Compiled and edited in the office of the Canadian National Live Stock Records, Ottawa, 1922.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

Wild flowers of Canada. Montreal, The Montreal Star, n.d. 288 colored plates.

Bees for beginners. Welwyne, Herts., Eng. E. H. Taylor, ltd. 129 p. il.

The pioneers of Old Ontario, by W. L. Smith. Toronto, G. N. Morang, 1923. 343 p. il.

Farm implements and machinery, by J. R. Bond. London, Benn bros. ltd. 1923. 282 p. il.

Farm science; a foundation textbook on agriculture, by W. J. Spillman. Yonkers-on-Hudson, N.Y., World book co. 1919. 344 p. il.

Gardening under glass; a little book of helpful hints written particularly for those who would extend their gardening joys around the twelve-month, by F. F. Rockwell. Garden City N.Y. Doubleday, Page & co. 1923. 297 p. il.

The new air world; the science of meteorology simplified, by W. L. Moore. Boston, Little, Brown & co. 1922. 326 p. il.

Engineering on the farm; a treatise on the application of engineering principles to agriculture, by J. T. Stewart. Chicago Rand, McNally & co. 1923. 538 p. il.

The farmer and his community, by Dwight Sanderson. New York, Harcourt, Brace & co. 1922. 254 p.

The agricultural bloc, by Arthur Capper. New York, Harcourt, Brace & co. 1922. 171 p.

Farm live stock of Great Britain, by R. Wallace and J. A. Scott. 5th ed. rev. & enlarged. London, Oliver & Boyd, 1923. 868 p. il. 442 plates.

The chemistry of leather manufacture, by J. A. Wilson. New York, The chemical catalog co. 1923. 343 p. il.

The principles of agriculture; a text-book for lecturers on agriculture, rural school masters, young farmers, and students of agriculture, by James M'Cutcheon. Edinburgh, E. & S. Livingstone, 1909. 207 p. il.

A laboratory handbook of bio-chemistry, by P. C. Raiment and G. L. Peskett. London, Edward Arnold co. 1922. 102 p.

Bleaching powder and its action in bleaching. Original memoirs by R. L. Taylor. London, John Heywood, ltd. 1922. 79 p.

An introduction to the theory of statistics, by G. Udny Yule. London, Charles Griffin & co. 1922. 415 p.

Building a community, by S. Z. Batten. Philadelphia, The Judson Press, 1922. 167 p.

Poisonous plants of all countries, by A. Bernhard-Smith. London, Bailliere, Tindall & co., 1923. 112 p. il.

A science course for bakers, by David Ellis. London, Blackie & son, 1923. 175 p. il.

An introduction to the chemistry of plant products; Vol. II: Metabolic processes, by Paul Haas and T. G. Hill. London, Longmans, Green & co. 1922. 140 p.

Precis de parasitologie humaine, par M. Neveu-Lemaire. Paris, J. LaMarre, 1921. 466 p. il.

Quantitative agricultural analysis, by E. G. Mahin and R. H. Carr. N.Y. McGraw-Hill book co. 1923. 329 p. il.

Standard mechanical practices in repairing farm machinery & equipment, by G. H. Radebaugh. Milwaukee, Wis. The Bruce publishing co. 1923. 260 p. il.

Popular poultry pointers, by R. R. Hannas. N.Y. Macmillan co. 1923. 207 p.

Ancient man; the beginning of civilization, by H. W. Van Loon. New York, Boni & Liveright, inc. 1922. 208 p. il.

The early herdsmen, by K. E. Dopp. New York, Rand McNally & co. 1923. 231 p.

The outline of science, by Prof. J. Arthur Thomson. New York, G. P. Putnam's sons, 1922. 4 volumes.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

SCIENCE AND PRACTICE OF AGRICULTURE

GENERAL INFORMATION

1132.—Destruction of Mosquitos by Eels.—DUBOIS, R., in *Comptes rendus hebdomadaires des seances de l'Academie des Sciences*, Vol. 175, No. 10, pp. 431-432. Paris, Sept. 5, 1922.

From experiments made by the writer it was found that young eels live well for a long time in very impure water and that in such water they are very active in destroying the larvae of mosquitos, and possibly also the eggs of several intestinal worms. They are so voracious at the commencement of spring that the writer no longer found any anopheles larvae in ponds where there had been large numbers before the eels were introduced.

The writer thinks that it would be very advantageous to keep young eels in all waters containing larvae of mosquitos both in the case of drainage water and other very contaminated waters. The exceptional hardiness of these fish, their low cost, the facility with which they can be caught and transported in large numbers, make them preferable to gold-fish (which have been recommended for killing larvae) and suggest that they would be very useful for the control of malaria by natural means.

904.—The Teaching of Soil Bacteriology.—BROWN, P. E., in *Journal of the American Society of Agronomy*, Vol. 13, No. 8, pp. 323-329. Washington, Jan. 1922.

It has been said that soil science is the basis of agriculture. It covers an extensive field and the fact that it is now taught in several courses is not only through pedantry but also because it has been found necessary in order to impart a thorough knowledge of the subject.

From experience gained at Iowa State College it may be taught with advantage in four courses, of which one is general and introductory, one final and applied and two intermediary on fertility (especially as connected with chemistry) and on bacteriology.

Soil bacteriology is a branch which has only recently been differentiated from agricultural bacteriology. In the curriculum of nearly all agricultural schools it has not yet been treated as an independent branch, but it is nevertheless of growing importance. At present soil bacteriology can no longer remain an accessory, almost fortuitous subject, included in agricultural bacteriology.

Up to the present time there is still a lack of special works on soil bacteriology; instruction should therefore be oral, and enlivened by discussion and written work, which greatly tend to enlighten the mind.

Certain subjects, such as nitrogen fixation, nitrification, the carbon cycle, the sulphur cycle, the phosphorus problem, the part played by fungi, the occurrence of protozoa, etc., should be emphasized particularly; others of minor importance, such as denitrification, should be minimized. The subject matter should not be too technical and intricate, but simple and concrete and directed towards enlightenment in the practice of agriculture, tillage, manuring, liming, drainage, etc. It should arouse the attention and keep up the interest of the pupils; and should be completed by demonstration and laboratory experiments.

1251.—Experimental Work in Progress in the Laboratories, Rothamsted Experimental Station, England.—*Current Leaflet*, pp. 1-8. Harpenden, 1922.

The investigations and experiments carried out at the Rothamsted Experiment Station, both in the laboratory and in the field are of worldwide importance. The following resumé has been made of the experiments now in progress:—

Bacteriological Department.—Main lines of work now proceeding:—

(1) A study of the rapid changes in bacterial numbers in field soil and their relationship to nitrate increase and decrease. The method of study consists in taking soil samples from a plot at two hourly intervals for periods up to 86 hours and estimating bacterial numbers and nitrate for each sample.

(2) A study of the soil bacteria capable of decomposing phenol, cresol and naphthaleen

These organisms are of importance as they limit the use of the antiseptics in soil, for the destruction of pests. The investigation comprises the geographical distribution of the organisms, their physiology, and the changes which accompany the addition of phenol to soil.

(3) The influence of farmyard manure on the growth of clover and other leguminous crops and on the development of the root nodule bacteria, is being studied in pot experiments and in the field.

Botanical Department.—In the Botanical Department, problems relating to the nutrition and growth of plants come under consideration and are dealt with chiefly in pot and water cultures. Special attention is being directed to the effect of high temperatures and excessive sunshine on growth and also to the stimulating action that appears to be exercised by very small quantities of certain chemical substances, such as boric acid, which are poisonous in heavier doses.

The comparative effect of artificial fertilizers on meadow hay is investigated by means of detailed separations of the hay from year to year, the relative amount of the different species varying considerably with the manure.

Soil chemistry.—(a) *Nitrogen cycle.*

(1) The rapid fluctuation in nitrate content of field soils and their relation to bacterial numbers (in co-operation with the Bacteriological Department).

(2) The rate of nitrification of sulphate of ammonia applied to field soil as early and late top dressings.

(3) The fixation of nitrogen by green algae in pure culture (in conjunction with the Mycological Department, Algology Section).

(4) The development of improved methods of analysis for the study of the nitrogen compounds of the soil.

(5) A survey of the total nitrogen content of the soil of certain fields.

(b) *Carbon Cycle:* (1) A study of the organic matter of the soil with special reference to humic products; their mode of formation, properties and distribution.

(2) The dephenolising power of the soil, with special reference to the action of manganese.

(c) Green manuring: The relative value of different systems of green manuring and their effect on the nitrogen cycle and carbon cycle in the soil.

Fertilising chemistry.—(a) *Phosphatic Fertilisers.*—A study of the citric solubility of different basic slags and mineral phosphates and its relation to their manurial value.

(b) *Potash fertilisers.*—A study of the relative manurial values of sulphate and chloride of potash, and of their effect on the soil.

Routine Analysis.—A very large number of analyses of soils, manures and plant products are made every year by the assistant staff.

Fermentation Department.—In the laboratory for Fermentation Work the methods for converting straw into artificial farmyard manure are being studied with a view to reducing the cost of production on the large scale. The fresh water required to wet the straw is not available in many places, but a considerable amount of surplus straw lies along the Essex creeks. Straw has been treated with sea water and found to produce a satisfactory manure although the fermentation proceeds more slowly than with fresh water.

Many types of waste vegetable material have been tested and some of these yield a richer manure than straw. The quantities available in this country are however very limited.

Insecticide and Fungicide Department.—The work done in this department can be classed under two headings:

(1) The study of natural and synthetic products with the main purpose of correlating chemical constitution and physical state with toxicological action on plant pests and disease organisms.

During the past two years, investigations have been made on the toxicity of many chemical products to soil pests such as wireworms and eelworms both on a laboratory and large glass-house scale.

Certain plants poisonous to insects have been examined and one of them, Tuba root found to be efficacious against caterpillars.

At present an attempt is being made to find a substitute for nicotine by examination of various synthetic products.

(2) A biochemical study of the nature of immunity particularly with reference to Wart Disease of Potatoes (*Synchitrium endobioticum*). Attempts are being made to correlate certain biochemical and physicochemical factors with immunity. Collateral properties, such as the boiling and cooking qualities of potatoes have a place in this research.

Various grafting experiments are being done and attempts made to find a fungicide capable of eradicating the disease.

Protozoology Department.—The investigations of Russell and Hutchinson on partial sterilization of the soil lead to the view that in normal soil the increase in bacterial numbers was inhibited by a biological factor provisionally regarded as the soil protozoa. Recently satisfactory methods have been devised for counting these organisms and an extended experiment covering 365 days showed that an inverse relationship exists between the bacterial numbers and those of the active amoebae.

Flagellates do not appear greatly to affect the bacterial numbers, but in one species the active numbers show a two-day periodicity.

The physiology of the dominant species of soil protozoa is being investigated, and a survey made of the protozoan population of soils obtained from various parts of the world.

SOIL PHYSICS DEPARTMENT.—The properties of the soil that are at present studied in this department can be broadly divided into two groups dealing respectively with the soil particles themselves, and their relations to the soil water. The first group embraces problems of soil tilth, the effect of clay and organic matter, and the colloidal properties of soil. The second group includes studies of the complex relations between the soil-solution and the soil and an important investigation into the hydrogen-ion concentration of the soil-solution.

Considerable field work, involving dynamometer measurements with different implements, is done on soil cultivation, and in the meteorological section of the department observations are made on the effect of meteorological conditions on the soil.

STATISTICAL DEPARTMENT.—The statistical laboratory was founded in 1919 with a view to applying the powerful methods of analysis supplied by modern statistics to the agricultural, meteorological, and biological observations made at the station. The Rothamsted crop weather records extend for nearly seventy years, and in accuracy as well as in extent form an unpararelled body of data for the study of the causes of crop variation. Three main causes of variation have been distinguished in the wheat yield from Broadbalk field; of these the most important is that of the weather, the very complex effects of which are in process of analysis.

INSTITUTE OF PLANT PATHOLOGY.—*Entomology Department.*—The work of this Department is divisible into 4 chief branches:

(1) Research work on the biology of Aphides, with special reference to the Bean Aphis (*Aphis rumicis*) including factors underlying the different phases of its reproductive capacity and the relative susceptibility to attack of different varieties of broad beans and field beans.

(2) Researches on the insect and other invertebrate fauna of the soil with particular reference to distribution in depth and the effects of manurial and other treatments of the soil.

(3) An investigation of the relative toxicity of various chemical compounds and their possible value as insecticides (in conjunction with the Insecticide and Fungicide Laboratory).

(4) The life-history of the gout-fly of barley (*Chlorops taemopus*), its winter host and methods of control.

MYCOLOGY DEPARTMENT.—Among the investigations in progress are: (1) The numbers, distribution and functions in the soil of the fungi and microscopic green plants (*Algae*). A monograph on these organisms and their soil activities is being prepared.

(2) The killing powers of various chemicals, heat, etc., on fungi and the way in which death is brought about.

(3) The growth of fungi in relation to various external conditions.

(4) The changeability of fungi and bacteria in various ways such as their power of attacking plants, etc.

(5) Various problems in connection with wart disease of potatoes, more particularly the relation of the last to the fungus and methods of getting rid of the latter from the silo.

(6) An intensive study of the parasitic fungus *Botrytis cinerea*, which causes grey mould.

(7) The fixation of nitrogen by green algae in pure culture (in conjunction with the Chemical Department).

CROPS AND CULTIVATION

914. -A Method for Counting the Number of Fungi in the Soil.—WAKSMAN, S. A., in *Journal of Bacteriology*, Vol. 7, No. 3, pp. 339-341. Baltimore, May 1922.

The spores of hyphomycetes and other fungi in the soil are estimated by the plate method by the same media and dilutions as are used for bacteria. As these bacteria are very numerous, the dilution of the soil is necessarily very high; but in these dilutions the fungi become so rare that very few appear on the plate; in fact many plates are entirely free from fungi. The work therefore becomes impossible, or involves great error. But if the dilution of the soil be reduced, the bacteria become so numerous as to prevent the development and consequently the numbering of the fungi. This difficulty was obviated by making use of acid media in which bacteria do not develop but fungi grow readily; in this way a very low dilution of soil may be used. The author now gives the formula of an acid culture which gave very good results. In an experiment, he found 29,400 (± 1,700) germs per gram of soil, whereas with agaragar and egg-albumen an impossible 460,000 (± 94,000) were found, that is, 20 times as many; the soil dilutions in these two cases were respectively, 1,000 and 200,000. The method may also be applied to the determination of the number of fungi in food preparations. The formula is as follows: glucose 10 gm.; peptone, 5 gm.; acid potassium phosphate 1 gm.; magnesium sulphate 0·5 gm.; distilled water 1,000 cc. Boil, add sufficient sulphuric acid or phosphoric acid to bring the reaction to 3·6 to 3·8 pH (usually 12-15 cc. are sufficient); add 15 gm. of agar, boil, run into tubes and sterilize as usual. The final reaction should be 4 pH.

920.—Necessity for Defining Soil Types in Investigations on Yield.—BROWN, P. E., in *Journal of the American Science of Agronomy*, Vol. 14, No. 5, pp. 198-206. Geneva, N.Y., May 1922.

Until comparatively recently there has been a tendency to make a general application of culture investigations, the results of which, on the contrary, apply only to the soil used. The numerous disagreements and contradictions in the results obtained by different investigators, and even by the same investigator, should be attributed in a great measure to the fact that conditions were different and above all that different soils were used. Many of the failures of farmers when applying these results to field work are due to this; hence the distrust in these experiments felt by practical men. Nevertheless, agriculture is greatly indebted to experimental work, which has proved of inestimable economical value and needs no apology.

Few of the results of experiments apply to *all* soils; generally, the particular soil type should be taken into account. Numerous investigators continue to ignore this essential feature. This is partly explained by the fact that they wish to make the best of their results by applying them generally; at the same time the farmers ask for advice which may be put into practice without difficulty and with the fewest possible restrictions. It should be remembered also that the experimental stations and scientific laboratories have a tendency to publish as much as possible and that the investigators desire to make themselves known early and to acquire honours, which blunts their critical sense and leaves their published works defective. There is a tendency to arrive at hasty and too generalised conclusions which leads to disillusion. Applications should be more specific.

Care should be taken however not to fall into the opposite extreme, as LIPMAN and LINHART have done, according to whom fertiliser tests are of very limited application, of no practical value and do not justify the expenditure of energy and money involved. This hypercritical attitude has no foundation; unfortunately it influences the uninitiated and brings discredit on soil experimental work in the minds of other scientists, farmers and co-operative societies.

What is of importance is to determine the soil type when making investigations. Once this is done there can be no question but that under the same conditions results on the whole will be similar. After a very long experience, the writer is convinced that the classification by the U.S. Bureau of Soils gives a sound definition of soil types. This classification includes several hundreds of types; in some cases even the distinctions are so fine that it is impossible to distinguish the types described and this involves too much of the personal equation. In spite of this defect however, it is fundamentally sound and it offers a firm basis for scientific and practical men.

To prove the different reactions of dissimilar soils treated with the same fertiliser, the author describes numerous field experiments carried out on 10 soils to which he applied 5 kinds of fertiliser and on which he cultivated oats, clover and maize, and also pot experiments on 9 soils treated in the same way and on which wheat and clover were grown. Certain fertilisers proved beneficial, though in varying degrees, to certain cultures on all the soils; thus, lime to clover and manure to maize and oats. Other treatments, however, gave very different results with the same crop on different soils. Thus, in a pot test, a complete fertiliser gave an increase of 60 per cent in clover yield over the control in one soil, and 900 per cent more in another. Different soils, therefore, may respond in a very different way to fertilisers and correctives. This fact is well known as regards sulphur, potassium, etc. The influence of fertilisers as regards the nitrogen content of tops and roots varies; that on bacteria also varies, and the author has made a special study of this question. Other investigations have been made by him to determine the relations between the soil type and its chemical composition.

926.—Relation Between Nitrogen in the Soil and Live Stock Farming. WILLIAMS, C., in *Journal of the American Society of Agronomy*, Vol. 14, No. 5, pp. 159-162. Geneva, N.Y., May 1922.

Since 1910 the writer has been making comparative experiments at the Station which he directs, in live stock farming and the direct utilisation of the various crops. The rotation followed is maize, soybeans, wheat and clover. Each area receives 2 tons of ground limestone and 700 pounds of 16 per cent acid phosphate per acre, per rotation. In the first system, all the crops except wheat are fed to live stock or passed into the manure as bedding and the manure is applied to the maize crop; in the second, the maize, soybeans and wheat are removed and sold, the hay and straw being left upon or returned to the land; and the clover is not harvested, but allowed to stand until ploughed under the following spring. The comparison shows the superiority of live stock farming, which increases the crop production and the nitrogen content of the soil.

938.—The Function of Manganese Fertilisers.—In a report by BOCHER, H., Member of the Higher Council on Agriculture at the Agricultural Academy of France, sent by Mr. Louis-Dop, French Delegate, Vice-President of the International Institute of Agriculture.

It may be said that to-day no farmer is ignorant of the action of manganese fertil-

isers, and also that among scientists few know the function and value of salts of manganese in agriculture. Nevertheless, everyone has heard of the manganese fertilisers placed on the market in 1910 by a commercial firm who advertised them widely. They were also well known after the long and minute researches made by M. BERTRAND, Professor at the Sorbonne and Pasteur Institute, who proved the following facts:

(1) Plants need manganese for the development of their cells;

(2) Manganese is a catalytic substance and a soil fertiliser.

M. PICARD of Paris in 1898 also pointed out to the Academy of Science (*Academie des Sciences*) the presence of manganese in the greater number of plants and proved its very important physiological function, especially at the beginning of plant life, at the moment of germination and early growth. M. GRANDEAU, Chief Inspector of Agronomical Stations, had also observed that manganese exists in all plants and that its presence seems necessary to plant growth. Further researches made by scientists of all countries have substantially confirmed these assertions.

Manganese acts in a variety of ways: directly or catalytically as fertiliser, stimulant, antiseptic and anticryptogamic; it accelerates germination and maturation, increases the yield and improves the crop.

Experiments made everywhere, in Europe and Japan, have given results varying in importance but rarely negative. Difference of opinion arises not as to the actual principle of the function of manganese, which is incontestable, but as to the form in which it should be used. Many consider that oxides are ineffective; sulphate and chloride have given doubtful results, but carbonate and especially lime with manganese have been almost unanimously approved. The author next reviews all the researches which have been made in this matter up to the present, and hopes that further investigation will soon solve the remaining problems.

BERTRAND has proved that the action of manganese is catalytic and influences the composition of various bodies without itself being modified, a suitable application of manganese stimulates the micro-floral activity of the soil and ensures the better utilisation of the existing food material.

BOULLANGER has proved the great difference in the catalytic power of manganese according as the soil is rich in nitrogen, phosphoric acid and potash. In poor soil, chloride of manganese gave only a slightly increased yield of potatoes, but in rich soil, it showed an increase of 32 per cent. CANDA, in Italy, also maintains that manganese has an indirect catalytic effect and dissolves the previously existing fertilisers. In poor soil, its action may even be injurious. KELLEY, on the contrary, maintains that the stimulating action of manganese is positive in poor clay-silicic soils, slight in rich soils and negative in acid soils.

STEYN and BURGERS in Holland, observed that after the use of manganese, maize showed much greater development, the leaves became much larger and there was an increase in yield of 100 qu. Aso in Japan, SOLOMON in Italy and DUMONT in France were also in favour of its use.

Investigations on the beneficial effect of manganese on plant life and especially on the acceleration of germination were made by the following: GAROLA, CROCHECIELLE, NOTTIN, BARTMANN, LOEW, BOULLANGER, VOELKER, BAUER and MOLINARI.

Experiments by RAY, PRADIER and BARTMANN prove that manganese accelerates maturation.

The increase in yield through manganese has been proved by numerous experiments, THOMASSIN obtained an increase of 20 to 35 per cent in oats and 15 per cent in beets; BOULLANGER an increase of 12 per cent in oats with lime and manganese only, and of 40 to 48 per cent by the addition of other fertilisers; Aso in Japan obtained an increase of 30 per cent in the rice yield; and BARTMANN'S experiments on maize, cabbages and potatoes were equally conclusive, as well as those by GARDA on flax, LEBLANC on asparagus and BLANCHARD on onions.

Manganese not only increases the yield, but in many cases considerably improves the quality; this is especially the case with beets. GAROLA observed that manganese sulphate not only increases the weight of beets, but their sugar content also, by 50 per cent; manganese chloride, which increases the weight still more, on the contrary increases the sugar content only 25 per cent, GREGOIRE attributes to manganese an increase in sugar content and a corresponding decrease in weight, so that there is neither gain nor loss. DELORME and BOULLANGER observed that barley for malting did not increase in weight but improved in quality, the grain becoming larger, whiter and better nourished. J. M. SAULNIER obtained very favourable results by using manganese salts.

As regards its antiseptic and anticryptogamic qualities VON BAUER observed that manganese causes chlorosis spots on diseased plants to disappear. CLAUSEN HAIDE successfully used manganese against oats jaundice. DEMOLON, SIROT and JORET proved that slags used in agriculture contain from 4 per cent to 5 per cent of manganese to which they attribute some of the useful effects of basic slag which were previously thought to be due to phosphoric acid and lime.

To sum up, from all scientific research, and in addition from the results already obtained on farms, the importance of man-

ganese becomes evident. It remains to be seen:—

(1) In what form manganese salts should be used.

(2) On what soils and crops they give the best effects.

(3) Whether they should be used alone, or mixed with other fertilisers.

The author concludes by insisting on the urgent necessity of further and numerous experiments to determine the exact value of this new fertiliser.

1152.—Borax in Fertilisers and Its Effect on Potato Growth and Yield.—Brown, B.E., in *U.S. Department of Agriculture, Bulletin No. 998*, bibliography of 9 works. Washington, D.C., July 1922.

Injury to field crops through the use of fertilisers containing borax was first observed by Conner, in Indiana, in 1917. Many serious cases of borax injury were reported in 1919, when ample proof of the poisonous action of this compound was given. In 1920, a series of well-controlled field tests were conducted on four different types of soil bearing crops of potatoes, maize, peas and cotton respectively.

The author gives an account of the results obtained in Maine on loam; the borax was applied at the rate of 1 to 400 pounds per acre and there were twelve experiment plots. The fertilisers containing borax were applied differently in the three sections: in section 1 they were applied in the furrow 6 days before planting; in section 2, they were applied in the furrow at the time of planting; in section 3, they were sown broadcast and well raked into the soil before planting.

After one month the number of plants in the control plots was 343; these plots had received one ton fertiliser per acre but no borax. The plot that had received 10 lb. of borax per acre had 284 plants. The 20 lb. application showed 205 plants; the 50 lb. application 116; the 100 lb. application 38; the 200 lb. 18 and the 400 lb. application only 12 plants. At the end of the second month the author inspected the sections and found great differences in them. The section which had been treated in the usual manner by applying the fertiliser in the furrow immediately before planting was the most seriously affected, while that in which the fertiliser-borax mixture was introduced into the furrow some time before planting had suffered least. As the quantity of borax increased the toxic effects progressively increased also. In section 2 the injury was apparently produced with 3 or 4 lb. per acre and certainly with 5 lb.; the injury with 10 lb., or more, was very noticeable. During the investigational survey in Maine in 1919, the amount of anhydrous borax found in commercial fertilisers ranged from 0·73 to 2·3 per cent. In view of the fact that 2,000 lb. represents the usual quantity of fertiliser applied per acre, it is clear that the amount of borax applied varied from 14·6 to 46 lb. per acre. The type of field injury shown in 1919 was similar to that found in the 20, 30 and 50 lb. applications in the borax experiment.

Some of the injurious effects noted in both seasons were as follows: failure of seed to germinate, dying back of underground shoots, bleaching of foliage, or in less serious cases, marginal yellowing of leaflets, reduction in yield. Yield when 50 lb. of borax were applied per acre, was decreased 55 per cent in the second section and 40 per cent in the first and third sections.

1268.—The Effect of the Application of Various Salts Upon the Nitrogen-Fixing Properties of Soil.—Greaves, J. T., Carter, T. G., and Lund, J., in *Soil Science*, Vol. XIII, No. 6, pp. 481-499, bibliography of 51 works. Baltimore, June 1922.

The authors after having studied the ammonification and nitrification of a calcareous clay, now describe a series of experiments on the nitrogen-fixing capacity of the same soil, the methods adopted being those previously used. A large number of 100 gm. soil samples were analysed and placed in sterilised test-tubes the same amount of lactose, and different quantities of the various salts used in the experiment being added in each case. The humidity was brought up to 18 per cent and the samples incubated at 28°-30° C. for 3 weeks. The amount of nitrogen was then estimated by taking the average of at least 4 determinations.

The authors employed in their experiments: the chlorides, nitrates, sulphates and carbonates of sodium, potassium, calcium, magnesium, manganese and iron. The results obtained led them to adopt the following conclusions:

The toxicity of the salts used depends upon the nitrogen fixation of the given salt, and not on the negative electro-ion as in the case of the ammonifying bacteria. In the soil chosen for the experiment, the salts proved less toxic to the nitrogen-fixing bacteria than to the nitrifying and ammonifying bacteria.

The amount of a salt that can be introduced into a soil without hindering nitrogen-fixation varies according to the salts. The proportions below which some of the salts proved innocuous were as follows:—Sodium salts, 1 part in 400 million parts of soil; calcium nitrate, sulphate and carbonate, 1 part in 400 million parts of soil; magnesium, chloride and sulphate 243; manganese nitrate 550; ferric chloride 272.

The other salts became toxic in certain proportions in the following order:—

(1) Magnesium carbonate	(7) Iron sulphate
(2) Magnesium nitrate	(8) Calcium chloride
(3) Potassium carbonate	(9) Manganese chloride
(4) Iron carbonate	(10) Potassium chloride
(5) Manganese carbonate	(11) Potassium sulphate
(6) Iron nitrate	(12) Potassium nitrate
(13) Manganese sulphate	

None of the potassium chloride and carbonate concentration used in the experiment stimulated nitrogen fixation. The other salts, especially calcium, nitrate, sodium carbonate and potassium sulphate, increased it in varying degrees.

When the soil is not acid, the alkaline constituents hinder ammonification and nitrification much sooner than they retard nitrogen fixation.

1270.—The Effect of the Continuous Application of Chemical Fertilisers Upon Soil Reaction.—Burgess, P. S., in *Agricultural Experiment Station of the Rhode Island State, College Bulletin 139*, pp. 3-35, bibliography of 22 works. Kingston, Rhode Island, April 1922.

The author describes a series of experiments undertaken with the object of determining the effect of different fertilisers upon the reaction of the soil. These experiments were conducted at the Rhode Island Experiment Station where there are many plots under the same conditions and occupying an extensive area of sandy-clay which were eminently suitable for the purpose. Samples of soil were analysed every 4 or 5 weeks from May to September 1921; they were taken near the surface (10 cm.), 12 to 26 borings being made for plot. The hydrogen ion concentration was determined in each case by Hildebrand's electometric method, and the lime requirement by Jones' calciuim acetate method.

The following conclusions can be deduced from the results obtained:

Basic slags, superphosphates, bonemanure and mineral phosphate waste all help to decrease soil acidity, as was shown by the comparison of the treated and untreated plots respectively. The three first fertilisers proved the most active in this direction. There is thus no foundation for the common opinion that the continued use of superphosphates renders soils acid.

Finely-ground fish-guano and sodium nitrate perceptibly diminish soil acidity, whereas dried blood, decomposed fish, ground hoofs and offal from the abattoirs and poulterers increase the acidity slowly but steadily. Ammonium sulphate has always been found to increase soil acidity more than any other nitrogenous fertiliser.

All the potassium salts slightly diminished the acidity of the soil, kainit being the most active; next come the chloride and sulphate of potassium although there is a little difference in their influence. The carbonates of sodium and potassium have much more effect than the chlorides of these elements in reducing acidity and, calculating the oxide equivalent, are twice as effective as lime fertilisers.

Soil acidity is slightly lowered by the application of a green manure composed of non-leguminous plants, but is raised by the ploughing in of a leguminous crop; this is perhaps to be attributed to the fixation of the nitrogen contained in the leguminosae.

Other factors besides fertilisers are naturally concerned in influencing the soil reaction, of these the chief are the type of soil and the nature of the crop. They must all be taken into account before any general laws can be formulated.

1279.—Advantages of Bicarbonate of Ammonia as a Fertiliser, Both From the Point of View of Its Production and of Its Use. Gluud, W., in I. *Chemiker-Zeitung*, Vol. XLXVI, No. 92, pp. 693-697. Cothen, August 3, 1922. II. *Ibidem*, No. 95, pp. 715-717. August 10, 1922.

I.—Bicarbonate of ammonia which contains 17 per cent of nitrogen and consequently 21 per cent of ammonia, has not yet been largely used in agriculture, though it has been frequently suggested. There are various prejudices against its more extended use, among which is an exaggerated fear as to its volatility. These prejudices should disappear in the face of actual farming practice, and also because, owing to conditions in Germany, there is a restriction on the consumption of sulphuric acid. Several German agricultural stations had very favourable results from experiments made in 1921.

The chief advantages of bicarbonate of ammonia are the following: it does not necessitate, like sulphate of ammonia, the saturation of the soil with useless or injurious matter: in sulphate of ammonia 300 kg. of sulphuric acid per 100 kg. of ammonia is required; 75 per cent therefore is not utilised. In 1909, 322,000 tons of sulphate of ammonia were applied to the soil, representing 239,000 tons of sulphuric acid, which, under present conditions, would be very expensive. Further, and this is still more serious, sulphuric acid transforms the lime of the soil into gypsum and acidifies it: potash and phosphate fertilisers lose their efficacy if this disadvantage is not avoided by liming; free sulphuric acid often is found, which damages roots, etc. Chloride of ammonia which is more economical than the sulphate and is therefore coming more and more into use, also posesses disadvantages: the chlorine combines with the calcium of the soil and forms soluble chloride of calcium, which is carried away by the rain, and the soil "cools."

Besides these negative advantages all the components of bicarbonate are useful: carbonic acid is one of the most important fertilisers and its action is exercised on the roots as well as on the leaves. Further,

carbonic anhydride costs next to nothing and may be had in unlimited quantities.

Bicarbonate, owing to its fine but not powdery consistency, may be easily spread over the soil, and even after a long period does not become clotted; on the other hand, carbonate has given bad results, for it forms into hard lumps, and the fact that farmers have often mistaken it for bicarbonate has been prejudicial to the latter.

There remains the great objection of volatility, but it has been much exaggerated, It has been proved that up to 50° and under unfavourable conditions, bicarbonate of ammonia loses almost exclusively carbonic anhydride, and only 0·12 per cent of ammonia on changing into sesqui-carbonate. It may be used as a fertiliser mixed with superphosphate, in which case it is fixed by the acidity of the superphosphate. It may be kept for about a year in the ordinary packing without appreciable loss, provided the atmosphere is dry. More impermeable packing may be used than the ordinary boxes and canvas bags. Excellent results have been obtained with paper bags prepared with a special resinous solution. Altogether it may be estimated that from the time of its storage in the factory until it is applied to the soil, less than 5 per cent is lost. Moreover, sulphate is also volatile to a certain extent.

From the industrial point of view it is advantageous in all respects. Ammonia is obtained by direct synthesis by means of the HABER process; carbonic anhydride is a by product of gas-works and the HABER process. The disadvantages attendant on the use of sulphate in farming have already led to an examination of the question of producing urea on a large scale; it is a neutral fertiliser, but the process of manufacture is complicated; also, the starting point in the process is bicarbonate of ammonia which, in consequence, will always be the more economical.

II.—The writer afterwards examines the various industrial manufacturing processes of bicarbonate of ammonia, shows their simplicity as compared with those of other nitrogenous fertilisers and draws attention to their economic advantages.

Further, in contrast to the other manufacturing processes, that of bicarbonate would be independent of several variable factors, such as the price of sulphuric acid, that of nitric acid, etc. The manufacture of bicarbonate, however, cannot be developed in Germany yet as it should be, on account of limitations imposed by the war.

1280. Chloride of Ammonium as Manure.—MAUME, L., in *Le Progres agricole et viticole*, Vol. 39, No. 25, pp. 588-592. Montpellier, June 18, 1922.

The writer gives an account of experiments made at the National School of Agriculture at Montpellier on two series of plots: in the first series the manuring was done 10 days before sowing and in the second series on the same day as the sowing. The plots were treated with various nitrogenous manures to the extent of 54 lbs. of nitrogen per acre and then sown with wheat. Taking the yield of the control plot, which was not manured, as equal to 100, the results with the various manures were as given in the following table:—

RESULTS OF THE MANURING EXPERIMENTS

Plots	In the first series		In the second series	
	Total weight of the crop	Weight of the grain	Total weight of the crop	Weight of the grain
1. Control	100	100	100	100
2. Cyanamide of calcium	120	148	102	108
3. Nitrate of soda	143	178	136	170
4. Nitrate of lime	134	152	115	145
5. Nitrate of ammonia	131	153	116	148
6. Sulphate of ammonia	128	152	117	148
7. Chloride of ammonium	134	154	123	150

Chloride of ammonium is therefore comparable with sulphate of ammonia, nitrate of ammonia and nitrate of lime and it could be used to great advantage as soon as it can be obtained at a more reasonable price.

The data in the table above show that generally there is great advantage in manuring before sowing, especially in the case of cyanamide of calcium, which had only a negligible effect in the second series, while it proved very effective in the first.

1282.—Selection and Treatment of Waters for Spraying Purposes.—DEONG, R. E., in *University of California Publications, College of Agriculture, Agricultural Experiment Station, Berkeley, California*, Bulletin No. 338, pp. 301-314. Berkeley, California, December 1921.

Hard water forms dangerous combinations with or destroys the efficiency of many forms of insecticides. Such waters are very common, especially in the West of the United States. Their distribution and degree of hardness is however a matter of which the knowledge is approximate only.

Softening hard waters by means of caustic soda or other water softeners is not completely successful in all cases, and hauling soft water from a distance in quantities sufficient for spraying purposes is frequently impracticable. Surface waters are usually softer than underground supplies, but storage of surface water during rainy seasons is possible only in limited areas.

Water softening plants may be installed at a cost of a few hundred dollars with a sufficient capacity for supplying a spraying outfit and also meeting the ordinary needs of the home.

The use of dusting materials in certain cases in place of liquid sprays, offers an advantage in that the user is independent of the type of water.

Insecticides, compatible with the soluble salts commonly found in waters are valuable and may be a satisfactory solution of the difficulty in some cases.

Water containing chlorine at the rate of 20 parts per million or more has been reported as dangerous to use with acid arsenate of lead, a soluble form of arsenate being formed, which may cause severe injury to foliage. Basic arsenate of lead should be substituted for the acid type, if used with very hard or alkaline waters.

Californian waters have an unusually high chlorine content, which may account for cases of arsenical injury that have occurred where acid arsenate of lead has been used.

1289.—On the Tillering of Wheat.—GARICKE, W. F., in *American Journal of Botany*, Vol. IX, No. 7, pp. 366-369. Brooklyn, July 1922.

The writer had previously remarked that nitrogen supplied to wheat at different times, had different effects; at an early stage it had little effect; at a later stage it caused an increase in the nitrogenous reserves of the grain and the whole of the dry matter in the plant. These experiments were made with a soil poor in nitrogen.

In the paper reviewed, the writer investigated the process by the help of which nitrogen induces tillering. He supposed that it acted by favouring the growth of the roots. In order to verify that supposition, he grew wheat plants, from 8 to 10 cm. high, with roots 10 to 12 cm. long for 25 days in drinking water: the roots grew to a length of from 50 to 70 cm., while the stems scarcely grew more than 1 or 2 cm.; he then moved the plants together with the control plants, and placed them in complete nutritive solutions; the weight of the aerial part was approximately equal in the two series, while the weight of the roots was respectively about ½ and ¼ of the total weight and the roots in the first series were 4 times as long. The control plants tillered very slightly, generally a single stem per plant; on the other hand the young plants with large root development tillered in a remarkable manner; the averages were, respectively, 1·2 and 5·4 per plant, a proportion of 1 : 4·5.

A large root development, therefore, is very favourable to tillering. In a soil poor in nitrogen, the roots develop very much because they seek out nutritive elements; if a large amount of nitrogen is put into the soil, the roots absorb it and vegetative growth is stimulated in them; there is consequently much tillering; on the other hand if nitrogen is given during the early stage of growth, the roots do not develop much and the growth cannot be stimulated later.

These data may be important for the cultural economy of wheat.

958.—A New Test for the Maturity of Fruit.—MURNECK, A. E., in *Station Bulletin* 186, 28 pp., 9 figs. Corvallis, Oregon, Nov. 1921.

Experience shows that pears, unlike other fruits, must be harvested in a comparatively unripe condition; thus Bartletts, when picked hard and green, ripen perfectly and attain the highest quality.

In most districts, the harvesting season of this variety lasts about a month, whereas it may take 6 or 8 weeks from the date of the first picking to the time the fruit becomes fully ripe on the tree. It would be useful to know exactly the right moment for picking in order that the highest keeping and eating quality may be realized. For this purpose it would be necessary to know exactly the changes that take place as maturity advances.

Many tests have been used to ascertain the stage of maturity of pears and the best time for picking: the colour of the skin, the colour and toughness of seeds, the sweetness, the ease with which the fruit stem will separate from the spur, the ease with which the fingers may be pressed into the fruit, the disappearance of starch, as tested by potassium iodide, etc. Ordinarily for Bartletts the largest transverse diameter (about 2¼ inches on an average) is taken as an index. All these tests, are however, uncertain. The Oregon Agricultural Experiment Station has therefore endeavoured to find a simple but reliable test. This problem has been made a part of the pear harvesting

and storage investigations which were begun in 1917 and have already formed the subject of two reports.

It has been recognized that the amount of pressure required to wound the fruit, that is, its resistance to pressure, gives a good, practical and delicate test.

To measure this pressure exactly, an apparatus was constructed after several attempts, a kind of pressure register, which solves the problem pretty well. The pressure required for a small metal cylinder to penetrate to a determined distance is registered in pounds on a scale.

To eliminate individual variation, it is well to examine lots of from 10 to 15 pears. The test should be made 6 hours after picking, and Bartletts, under good harvesting conditions, should register on an average 35, and not less than 25 pounds. If they register more, they are very ripe and may be used with advantage for canning or preserving. The Bosc variety should register 26 to 20 pounds when picked.

The author has applied the test to other varieties of pears and to apples and several fruit growers in the States of Oregon and Washington have already adopted it. The author has also studied the increase in diameter and weight of Bartlett pears during development. The transverse diameter increases each week 5·1 per cent on an average, and the weight 17·7 per cent, until the maximum development has been attained The ratio of percentage increase in weight to that in diameter is therefore about 1: 3·5; but deviations and exceptions render this criterion uncertain and not very practical.

LIVE STOCK AND BREEDING

1184.—Should Milch Cows Which React Against Tuberculin be Sacrificed? – CALMETTE, A. (Sub-Director of the Pasteur Institute at Paris) in *Revue veterinaire*, Vol. LXXIV, No. 6, pp. 356-362. Toulouse, June 1922.

The Board of Health of the Aisne Department have expressed a tentative desire to make the tuberculization of cows kept for the public milk supply compulsory, and to order that all cows :which react against it be sent to the slaughter-house. It is clear that if it were proved that there is a large percentage of milk cows reacting against tuberculin in France, the adoption of such measures would be attended with serious consequences, for it would cause a decrease in milk production and an increase in price of milk.

It would be opportune, therefore, to examine some of the facts recently established regarding the part played by bovine tuberculosis in human infection before putting these measures into execution.

It is known that the bacilli of tuberculosis *adapted to the bovine species*, have special characteristics which clearly distinguish them from those *adapted to the human species*, that the former are rarely met with in human tuberculosis and that the latter are but very slightly virulent towards cattle. For this and other reasons, it may be affirmed that bovine tuberculosis only plays a very small part in the etiology of human tuberculosis, and that consequently the campaign against it from the point of view of safeguarding of the public health is of little importance.

It is perfectly natural, on the other hand, that the economic interests of agriculture urge breeders to protect their cattle against bacillary infection, which causes a decrease in milk production and prevents the fattening of the infected animals.

The extent of these losses is considerable; they may be estimated in France, before the war, at 20,000,000 fcs. a year and in 1920, according to the statistics of the Veterinary Sanitary Department, about 2,000,000 cattle out of a total of 12,757,720 were tuberculous.

The writer asserts that all those animals which react against tuberculin are not tuberculous or liable to propagate the disease, but that reaction simply indicates the existence of a seat of infection which, in the majority of cases, remains occult or latent, and which, in many animals, is cured when the latter are kept free from infection for a sufficient time. It is inadmissible, therefore, that cows, without any trace of disease having been detected after a clinical examination and whose milk contains no tuberculous bacilli, should be excluded from milk production on the mere pretext that they have reacted against tuberculin. If this happened, it may be estimated that milk production in France would be reduced by a third, thus entailing a proportional increase in price without any appreciable advantage to public health.

The writer concludes with the assertion that from the sanitary point of view the measure proposed by the Board of Health of the Aisne Department appears unacceptable.

1186.—Sheep-Killing Dogs in the United States.—COLL, M. W, in *Farmers' Bulleton No. 1268* (*United States Department of Agriculture*), pp. 1-30, Washington, June 1922.

Sheep-farming in the United States has greatly varied in the last 5 years; the number of sheep decreased from 64 millions in 1903 to 26 millions in 1922, while the population has increased to such an extent that the present wool production of the U.S. is only one-half of that required. The future welfare of the people therefore requires that the greatest efforts be made to extend sheep-farming. This is rendered easier and more profitable by the fact that grazing and feeds are comparatively cheap and the demand for meat and wool is great. Among the obstacles against sheep-farming which

discourage farmers and prevent others from taking up this industry, should be mentioned the losses, sometimes considerable, caused to the flocks by dogs. The dogs which kill sheep generally range in small groups of two or three, but sometimes alone. They pass over a territory of several miles, attacking and destroying the flocks they meet with; and as they carry on these operations at night it is difficult to find them and still more difficult to take them in *flagrante delicto.* Some dogs kill one or two sheep, others as many as they come across; others again chase them until they die of exhaustion; these sheep are found dead without bites or wounds. Once a dog has killed a sheep it will kill others and will encourage other dogs in the same habit, which habit it is very difficult to cure. Their extermination therefore becomes a necessity.

A good means of protection is to pen the sheep on a grazing-ground surrounded by a wire netting about 6 feet high; but this is dear and can hardly be erected except on a small extent of ground. Better laws regarding the policing of dogs should be made than those which are now in force; the people would help to maintain them and they could be easily and advantageously applied. A very high dog tax could be levied in order to restrict their numbers, and the residue of such tax applied to relieving the losses caused to sheep owners. In some states there is no special legislation in this direction; the right to tax dogs is left to the parish, but this system does not give entire satisfaction. Other states have laws, which do not, however, require that the dogs be identified; others again require that they be identified and a description of the dogs kept in registers; a collar with a metal disk bearing a progressive number, the year and the name of the State, is placed around the dog's neck. In several states the owners are obliged to keep their dogs under control, especially at night; in other parts, dogs caught killing or chasing sheep may be killed, and in others again this is allowed when the dog is found out of doors during the night without its owner, or when it is without its collar with the disk, or when it can be proved to have killed sheep. The most recent laws provide for the possible compensation of the farmer for sheep killed or mutilated. In every state the owner of the dog is held legally responsible for any damage caused by the dog, but owing to the difficulty of identifying the owner, the farmer generally is only insufficiently protected. This is also the case in those states where farmers receive compensation out of the dog taxes, which are almost always insufficient.

In a word, the different states must take new, better and, as far as possible, uniform measures to remedy the defects of the existing laws. The writer quotes and examines the laws of the different states and draws attention to those of Michigan, which have given the best results. The writer advises all the states to adopt a law, with possible modifications and adaptations, based on the following essential points:

A tax to be paid on every dog of over four years, which must wear a collar with a disk supplied for the purpose; all dogs must be kept under control during the night and the owner to be fined for any infraction of this law.

The farmers to be compensated.

Dogs without an owner or which are caught mutilating sheep or poultry or found on an enclosure not belonging to their owner, may be killed.

1328.—Comparison Between Calcium Chloride and Other Calcium Salts as a Stock Feed. LOEW, O., in *Suddeutsche Landwirtschaftliche Tierzucht,* Year 17, pp. 13-15. Munich-Hanover, January 27, 1922.

Calcium salts, the carbonate (chalk), and the phosphate have hitherto been fed to young stock in the form of a powder mixed with their rations, for the purpose of promoting bone development. Recent experiments have proved that the calcium salts present in the blood and muscles have other no less important functions than that of building up the skeleton, and must be regarded as factors essential to the normal working of the living organism. It is not known at present how much of the powdered calcium given to the animals is assimilated by the blood and tissues or in what percentage it is absorbed by the stomach. In any case, it is necessary to administer the calcium salts in a form soluble in water and which can be easily assimilated.

The use of chalk, the calcium compound generally employed, has many drawbacks, as calcium carbonate is dissolved by the acid in the gastric juice, which acid is required for digestion and is indispensable for the digestion of albuminoid substances.

In order to produce any perceptible effect on the organism, a very large amount of chalk (1·6 ounces) must be ingested daily; this requires for solution 4 gallons of gastric juice which is thereby completely neutralised and rendered relatively incapable of digesting the remainder of the ration. Further, the lack of gastric juice allows the numerous bacteria in the stomach to multiply freely. These statements have been proved by the results of some pig-feeding experiments in which the animals given maize, blood-meal and chalk developed more slowly than those that had received no chalk. The author is of opinion that calcium chloride is preferable to chalk, if given in much smaller quantities, as its effects are quite as beneficial and rapid as those of calcium carbonate and it has fewer drawbacks. In addition,

calcium chloride is of therapeutic value in the case of certain specific diseases (Diarrhoea, and sometimes in deficient bone development) whereas chalk has no such property.

Chloride of calcium is more expensive than carbonate of calcium, but is used in smaller quantities and produces a great increase in the live weight of stock, especially in the case of pigs. The results of experiments on young cows given carbonate of calcium showed an average increase in live weight of 220 lbs. as against 280 lb. obtained with chloride. In other experiments with 15 cows, the animals fed calcium chloride increased 10·1 per cent in live weight, while those given calcium carbonate only increased 8·5 per cent. If only the 6 youngest cows are taken into account, the average live weight increase was 20·5 per cent with calcium chloride, and 15·3 per cent with calcium carbonate. This shows clearly the superiority of the chloride, especially in the case of young growing animals.

1335.—Experiments on Cattle Feeding in the United States Experiment Stations.— SMITH, W. H., in *The Breeders' Gazette*, Vol. LXXXI, No. 3, pp. 71-72. Chicago, January 19, 1922.

During the last two years United States breeders have suffered heavy losses in cattle breeding, the total of these losses being ascertained from information collected at the experimental stations. From experiments made in 1919-1920 by experimental stations in the states of Nebraska, Wisconsin, Missouri, Indiana and Pennsylvania, which reared 26 lots of 256 calves, a net loss of about $30 per head may be inferred; similar results were obtained last season: 28 lots containing 247 beasts belonging to the experimental stations of the states of Nebraska, Iowa, Indiana, Minnesota and Pennsylvania showed a loss of about $26 per head.

Breeders, remembering that during recent years rations containing a large percentage of maize silage, with or without a few grains of maize, had given better, or at any rate, not worse results, applied to experts to know what quantity of maize should be added to the rations. To determine this quantity exactly experiments were conducted at several experimental stations. At the end of 1920 at the stations of Nebraska, Indiana and Minnesota, rations containing no maize were fed to one lot of steers and it was ascertained that in every case the rations without maize gave the heavier losses, while those with much maize, or of maize only gave the smallest losses. These results taught the farmers not to rely on the results of previous years and thus adopt rations which might have been good in time of war, that is to say, when economic conditions were very different, but owing to present prices, were no longer profitable.

F. C. KING (of the Indiana Station), notes, in examining the data for a period of 5 years, that the highest profits were always obtained by feeding with maize only. It was not until 1919-1920 that the use of silage-foods showed greater profits while the use of rations composed partly of silage foods and partly of maize was never profitable. After ascertaining that the most profitable ration is that composed entirely of maize an attempt was made to determine how and when the nitrogen supplement should be given. At the Minnesota and Nebraska Stations, the supplement was given in the form of linseed meal cake, but at both it was noted that the loss was more or less increased. At the Indiana Station cotton meal cake was used with better results and the loss decreased by about $2.40 per head. The experimentors at the Pennsylvania Station state that a nitrogen supplement is to be recommended and they tried to find out whether linseed meal cake or cotton meai cake was preferable. Linseed meal cake being laxative is more suitable for the steeers but it is better to use the cotton meal cake when the ration is largely composed of silage foods. The stations have also made experiments with substitutes for cereals, introduced during the war, the use of which tends to be continued on account of the high cost of cereals. They have ascertained that the use of barley with molasses instead of maize has never given satisfactory results.

1347.—Lucerne as Pasture for Pigs, in Germany.— FROLICH in *Zeitschrift fur Schweinezucht*, Year XXIX, No. 6, pp. 81-84. Neudamm, April 1, 1922.

The general importance of lucerne as a feed has always been recognized in Germany and the question of its particular utility as pasture for pigs deserves consideration.

The writer, after finding that the experiments on the subject hitherto made in Germany were insufficient, undertook a series of researches to ascertain if it were really profitable to utilize lucerne this way or not.

Twenty-two young "Landrasse" sows, slightly modified by crossings with a superior breed of a total weight of 4,136 lb. (average 187 lb. each) and a sow weighing 312 lb. were put out in a lucerne field with four wooden sheds where they could graze for about 2-3 hours daily. As the lucerne was already well grown the animals were allowed to graze for one morning only, the lucerne was then cut; three days later the sows were again allowed to graze; grazing had to be suspended on two other mornings after the second and third mowings. The lucerne was cut three times; it was found that the sows did not eat it so readily as before, perhaps because it had grown during very

dry weather; the sows only ate the upper part and did not touch the lower; for this reason other freshly cut lucerne had to be given to them.

Eighteen animals remained on the pasture for 102 days, 5 from 63 to 70 days; there was an average increase of 4 ounces each per day. On the other hand in the case of 5 sows the increase in weight was very much less than for the others; the writer therefore recommends ascertaining whether the animals are profiting by the pasture by weighing them regularly and eliminating those which are not giving good results. In addition to the lucerne eaten by the pigs the lucerne field yielded 4,300 lb. of hay in the three mowings and the area of the pasture was such that it would certainly have yielded a total of 15,000 lb. of hay, equal to 20 tons of green stuff; the daily ration of each sow was therefore 16 to 19 lb.

In conclusion it may be stated that pasture has considerable food value; really lucerne is one of the best foods for animals on account of its considerable albumen content, and they eat it readily, at any rate so long as it is not too old. Later on many of the sows littered and produced a considerable quantity of milk.

1348.—**Rape as a Valuable Pasture for Pigs.**—RICE, B. J., in *The Breeders' Gazette*, Vol. LXXXI, No. 16, pp. 329-350. Chicago, Ill., April 20, 1922.

Rape is one of the best forage crops for pigs, and compares favourably with lucerne and young clover; results of analysis show that it contains 20-25 per cent of protein and has a high content in ash and a low content in cellulose. The full-grown crop is succulent and very acceptable to animals; in favourable conditions one acre of rape provided sufficient pasture for 12 to 20 pigs from June 1 to October or November. By sowing in April it is possible with care to feed six porkers; the June growth, if there is a slight rainfall, will feed the pigs during the summer months or in the early autumn, when the pigs which are now much larger, can eat a considerable quantity. Animals fed on a succulent nitrogenous crop such as rape in July, August and September fatten more quickly and the meat finds a ready market.

Both statistical and experimental results agree in demonstrating that rape is economically one of the best pastures. During the experimental period at Illinois, pigs which were fed on maize and pastured on lucerne required for each increase of 110 lb. in live weight about 6½ lb. of maize more than the pigs which were fed on maize and pastured on rape. At the Purdue University pigs fed on rape put on 18 ounces of weight daily and those fed on clover only just over 1 lb. and the quantity of supplementary feeding necessary in relation to increase in weight was less with the rape. The pastures used on the farms, which in 1916 and 1917 gave the best selling and most profitable pork, were clover, lucerne and rape.

Rape is not only useful as a pasture in summer and autumn but can also be sown with maize; it makes better growth when the maize is not too closely sown. The crop cannot entirely replace the nitrogenous feed, which is needed by maize-fed pigs, but can greatly reduce the requirement.

The use of rape has the disadvantage that the leaves are so heavy that the dew is not evaporated before noon; hence the young pigs get wet and may contract illness through exposure to the sun's rays. However it is always possible not to put the young pigs to pasture in the morning and to give them instead a dose of oil.

1205.—**The Rearing of Geese in the United States.**—LEE, A. R., in *Farmer's Bulletin 767, United States Department of Agriculture*, 22 pp., 12 figs. Washington, Jan. 1921 (Revised April 1922).

In the United States geese are reared most abundantly in the south and middle west. According to the census of 1920, Illinois contained the greatest number of geese (195,769), followed very closely by Missouri, Arkansas and Iowa, and at a greater distance by Kentucky, Tennessee, Minnesota, North Carolina and Texas. During the last 10 years goose rearing has shown a tendency to greater extension in the Northern part of the Central States than in the southern part. About a tenth of the farms in the United States rear geese.

Six breeds of geese have been admitted to the "American Standard of Perfection," namely, Toulouse, Embden, Chinese, African, Wild or Canada and Egyptian. Besides these, the Sebastapol goose is also reared as well as hybrid varieties made by crossing the Canada with one of the above-mentioned breeds, generally the Toulouse or African. The African gander is occasionally crossed with the Toulouse and Embden, but never beyond the first generation; this cross is not generally advisable, and is suitable only for the production of geese intended for early killing or for fattening. The Toulouse and Embden breeds are the most extensively raised. Geese are kept primarily for the production of flesh and feathers, while eggs are of secondary importance.

The standard weights of the different breeds for the adult gander, young gander, adult goose and young goose respectively are: Toulouse 12-9-9-7; Embden, 9-8-8-7; African, 9-7-8-6; Chinese and Wild or Canada 5·5-4·5-4·5-3·5; and Egyptian 4·5-3·5-3·5-3.

The writer describes each of these breeds, and in connection with rearing gives rules regarding the construction of houses or shelters, selection, incubation, feeding of goslings, fattening and plucking feathers.

In an appendix a list of 25 works issued by the United States Department of Agriculture on poultry raising and egg production is given.

AGRICULTURAL INDUSTRIES

1220.—The Sugar Industry in Russia Before and After the War.—DADE, in *La Reconstruction*, No. 3, pp. 13-14. Berlin, May 27, 1922.

The growth of sugar beet in Europe has opened unexpected fields to the agriculturist. From an economic standpoint it has given an industrial complexion to agricultural enterprise and has improved the yield of the soil in a manner hitherto not thought to be possible. The mellowing of the soil by the deep roots of the beet, manuring and other favourable results inherent in this kind of cultivation have increased not only the yield of the beet itself, but also that of other crops grown afterwards on the same soil, as for instance that of wheat. From the social standpoint this cultivation has mobilized the agricultural labourer. The cultivation of beet had expanded to such an extent in Europe during the 20 years before the war that its production almost equalled that of sugar cane. Thus in 1912-13 the world's production of beet sugar reached 9,000,000 tons and that of cane sugar 9,300,000 or 18,300,000 total production. The production of beet sugar was therefore as much as 49 per cent of the whole sugar production. Probably no branch of agriculture was so hardly tried by the war. The restrictive measures taken by the state, the lack of artificial manures and labour caused the cultivation of beet to decrease by more than half its previous production. At the time when the production of cane sugar increased to almost 12,000,000 tons, that of beet sugar fell to 3,500,000 tons total, or scarcely a quarter of the production in 1919-1920. Before the war Germany headed the European production with 2,700,000 tons of sugar. Russia, with 1,900,000 tons came second, and had exceeded, shortly before the war, the Austro-Hungarian sugar production. The lowest yield was that of the crop of 1919-20, when Germany produced only 720,000 tons, that is to say a quarter, and Russia only 350,000, or a sixth of their pre-war production. In Germany it recovered in 1921-22 to about 1,400,000 tons, or 50 per cent of the old production, but in Russia it is still fairly low. Apart from Polish soils it is mainly the "black soil regions," especially in the Province of Kiew, Podolia, Volhinia, Tschernigow and Poltava, which are particularly suitable for sugar beet cultivation. In these provinces sugar beet cultivation, under the action of the "Normirowska" Syndicate, had reached a development which made these provinces the greatest competitors among producing countries of Western Europe in the world's market. These provinces having combined in 1902, at the time of the Brussels convention and having paralyzed Russian export, the Russian Government endeavoured to preserve its sugar industry by legislative measures. However the home consumption of the country could not be increased quickly enough and it was not easy to find new markets in the east to compensate for the loss of the western markets. Thus overproduction ceased to increase. The Russian Government was then obliged in turn to join in the Brussels convention in 1907. In 1912 the convention was renewed on the condition that its renewal should last up to 1918, and that Russia should have the right of export to the adherent countries of Western Europe, over and above her annual quota of 200,000 tons, an excess of 150,000 tons for 1911-12 and a surplus of 50,000 tons for the following years.

When war broke out, there were in Russia about 270 sugar factories, the area under beet crops was about 700,000 hectares and the production was over 100,000,000 pouds (about 1,630,000 tons). At the present time only one-third of these sugar factories are working, and the area under cultivation is not more than 40 per cent of the former area. It is not only the area under cultivation which has enormously decreased, but also the production of sugar. According to reliable information, beet growing has not, it is true, suffered so greatly from the war and the revolution as other branches of agriculture, because the peasants have understood its great importance and have managed more or less to preserve it from destruction. In the sugar industry also, the tendency was to pass on to the small rural proprietor an increasingly important part in the beet crop which formerly belonged exclusively to large proprietors. It should also be added that the labour question does not present the same difficulties in Russia as elsewhere, for work is generally done with the help of the peasants of the neighbourhood.

An attempt is now being made in the Ukraine to restore the beet sugar to its pre-war level and to procure seed in Germany so as to be able in three years to grow the necessary plants. Some experts even think that, if the situation remains quiet, in three to five years at latest, the growing of sugar beet will to a large extent recover in southern Russia.

1226.—The Foaming of Cream.—BABCOCK. C. J., in *U.S. Department of Agriculture*, Bulletin No. 1075, 22 pp. Washington, D.C., July 13, 1922.

Owing to the increasing use of whipped cream as human food and the small amount of knowledge that we have on the subject of the factors which determine the aptitude of cream to foam, the writer undertook an

experimental investigation. To measure the consistency of whipped cream, he invented a very simple apparatus, composed of a very small balance bearing a counterpoise at the end of one of its arms, and provided at the end of the other arm with a small rod ending in a disk; the counterpoise is moved until the disk penetrates into the cream, and the graduation on which the counterpoise happens to be indicates, approximately, the pressure in grammes per square inch. The results obtained may be summed up as follows:

Non-pasteurized cream whips better than pasteurized, homogeneized or pasteurized-homogeneized cream. Pasteurization slightly reduces the aptitude of the cream to foam, especially when it contains less than 23 per cent of fats. Homogeneization reduces very much the aptitude of cream to foam; the greater the pressure required to homogeneize the cream the more the aptitude of the cream to foam is reduced. Homogeneization combined with pasteurization renders the cream practically useless for whipping. The aptitude of cream to foam, whether poor or rich in fats, pasteurized or not, homogeneized or pasteurized-homogeneized, increases with the age of the cream. But the age of cream necessary for successful whipping varies with the quality and the fat content of the cream. In any case the most rapid changes take place during the first 48 hours, and after about 72 hours the greatest yield of whipped cream per weight unit of cream is obtained.

The aptitude of cream to foam improves with an increase in the fat contents up to 30 per cent; in higher percentages the quality or consistency of the whipped cream does not sensibly improve but the consistency lasts longer and the time required for whipping decreases.

Temperature is an important factor in the whipping of cream. To get good results, the temperature of the cream should not exceed 7°C. (44·6°F.)

Increased acidity by adding lactic acid or by natural acidification does not affect the aptitude of cream to foam so long as the acidity does not exceed 0·3 per cent; beyond that degree of acidity the cream has an acid taste.

"Viscogen" suitably used increases the aptitude of cream to foam and does not affect its taste. "Viscogen" (Babcock and Russell), The Restoration of Consistency of Pasteurized Cream, ***Wisconsin Agric. Exp. Station, Bulletin*** No. 54) is prepared in the following manner:—2·5 parts by weight of sugar are dissolved in 5 parts of water; 1 part of quick-lime is dissolved gradually in 3 parts of sugar and water; the liquid is strained through a sieve; the filtrate is stirred frequently and two or three hours later it is allowed to settle until the clear liquid at the top can be siphoned off. It must be used with discretion, that is to say in a quantity insufficient to render the cream alkaline.

Sugar added in sufficient quantity to thoroughly sweeten the cream, whether it is added before or after whipping, decreases its aptitude to foam; the smaller the amount added the less its effect. The addition of aromatic essences has no effect either on the quality or preservation of the whipped cream. The most important factors which determine the consistency are temperature, the quality of the cream and its fat content.

Cream powder will not whip. Condensed milk can be made to foam but the whipped cream so obtained disintegrates immediately; such milk therefore cannot be used for the purpose.

PLANT DISEASES

1386.—A New Potato Disease Observed in Morocco.—Miege, in *Bulletin de la Société de Pathologie Végétale de France*, Vol. IX, Part 2, pp. 109-112. Paris, 1922.

In 1920 and 1921, a new potato disease was reported from Morocco which causes considerable damage to the crops, but varies in its intensity and attacks most of the cultivated varieties of potato at all seasons of the year.

From field observations made at Rabat, the disease on the aerial portions of the plant is clearly basipetal, for it always starts at the extremity of the branch and usually, although not invariably, begins at the apex, or in the centre of the plant. The terminal leaflet becomes covered with brown patches as if it were scorched, and then turns black and withers quickly and completely. The petiole is immediately infected at its upper end and this part soon dries up and breaks off leaving intact the lower portion which remains healthy and green.

The disease continues to spread and quickly passes down the branch to the stem, destroying successively all the leaflets. At the end of some days the whole branch turns entirely black, withers and falls off; the main stem itself is attacked and becomes covered with elongated, blackish patches that start from the point of contact with the infected branch.

Sometimes the tubers are attacked before they are ripe; in certain cases on the contrary, the disease only makes its appearance on the potatoes themselves some days, or even weeks, after they are lifted. On the surface of the tuber small violet-black spots are seen; at first they are few in number, but they gradually increase. Subsequently, the portion of the layer beneath these spots turns a livid blackish-brown, and the affected area extends progressively. The disease spots liquify and exude, under the pressure of the fingers, a rather clear liquid. Then the tuber soon rots and becomes unusable.

The potato crop is much reduced, for even before the disease appears on the

tubers, their number and size are much diminished.

This disease is probably of bacterial origin. A bacterium has been isolated from infected plants and cultivated. The micro-organism was inoculated into twenty sound plants with foliage belonging to the "Geante sans Pareille" variety. The first symptoms of the disease showed themselves twelve days after the inoculation. Later it spread and became more virulent, and at the harvest time, several of the tubers exhibited the characteristic round violet-black spots. Further researches are however necessary, for it is impossible to arrive at any definite conclusions respecting the disease from the preliminary experiments hitherto made.

1389.—Mollisia Earliana, an Ascomycete Injurious to Strawberry Plants, in Ontario, Canada.—STONE, R. E., in *Phytopathology*, Vol. XII, No. 8, pp. 375-380, 3 figs. Lancaster, Pa., Aug. 1922.

In several places in Ontario, many strawberry gardens are serously affected by a disease, the presence of which may be detected in May by the appearance of small irregular purple spots on the borders of the leaflets; stripes of the same colour appear simultaneously on the petioles and on the floral peduncles. Gradually the spots increase in size and meet each other so that the whole leaf may be attacked. As the spots develop they become grey or ash coloured with a purple edge, which finally disappears. As the disease progresses all the leaves of the plant look dried up as if they had been scorched by fire. In the following spring the disease shows itself very early and may become serious before the strawberries are picked.

After picking, the disease makes rapid progress and all the leaves may dry up and become tindery as early as July or August. The diseased plants do not winter well and the crop in the following year may be very small.

All varieties are not equally attacked. It appears from observations made in open fields that the common varieties of strawberry plants may be classed in three groups:—(a) very sensitive—"Clyde," "Glen Mary," "Doctor Burrill," "Pokomoke," (b) fairly sensitive:—"Senator Dunlop," "Ruby," "William Belt;" (c) slightly sensitive:—"New Williams," "Portia," "Parson's Beauty," "Enhance," "Vanoise," "Joe."

Examination of the tindery portions of the spots on diseased leaves and petioles reveals the presence of fructifications of a fungus corresponding to *Marsonia Potentillae* (Desm.), Fisher, which may be quickly grown on ordinary media.

A pure culture of this fungus inoculated on the leaves of the strawberry plant soon produced the typical characters of the disease observed in nature.

If strawberry plants are covered, many leaves survive the winter and remain green, the fungus winters on these in a vegatative condition and produces abundant conidia in spring. An ascophorous stage is abundantly developed from April to June on the dried leaves, particularly on those most exposed. This stage could be identified as *Mollisia Earliana* (E. and E.) Sacc. and is developed on the dried leaves of the strawberry plants after *Mars. Potentillae* and often the conidia of the latter are found on the leaf together with fructifications of *M. Earliana*.

The results of numerous cultural experiments and of inoculation have clearly shown that *Mars. Potentillae* and *M. Earliana* are metagenetically interconnected; in all cases in which the ascospores of *M. Earliana* have germinated, a pure culture has been obtained which has produced spores of the *Marsonia* type; strawberry plants inoculated with spores in suspension taken from a pure culture obtained from an ascospore have shown the typical spots of *Marsonia* and, later typical fructifications of *Mars Potentillae*. The control plants remained entirely free from the disease. A complete description is given of the ascosphorous or perfect stage (*M. Earliana*) as well as of the conidian stage (*Mars. Potentillae*).

Although no experiments have been carried out, it may be supposed that the disease may be controlled by the same means as those used in controlling the "leaf spot" disease of strawberry plants (*Mycosphaerella Fragariae* (Schw.) (Lindau).

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

1139.—**Partial Sterilization of the Soil.**—RIVIERE, G., and PICHARD, G., in *Comptes rendus hebdomadaires des seances de l'Academie de Sciences*, Vol. 174, No. 7, pp. 493-495. Paris, Feb. 13, 1922.

1142.—**The Classification of Soil Moisture.**—PARKER, F. W., in *Soil Science*, Vol. XIII, No. 1, pp. 43-54. Bibliography of 22 publications. New Brunswick, N.J., Jan. 1922.

1149.—**The Nitrogen Industry in Germany**—I. MURAOUR, H., L'azote en Allemagne avant, pendant et après la Guerre, in *Chimie et Industrie*, Vol. VIII, No. 1, pp. 169-175. Paris, July 1922.—II. MATIGNON, C., L'Industrie des matières azotées en Allemagne, *ibidem*, pp. 176-184.

1190.—**Food Value of Oats and Tares as Green Forage, Hay or Silage.**—I. WOOD, T. B., and WOODMANN, H. E., Digestibility of Oat and Tare Silage, *The Journal of Agricultural Science*, Vol. XI, Part 3, pp. 304-309. London, June 1921.—II. WOODMANN, H. E., Comparative Determinations of the Digestibility and Metabolisable Energy of Green Oats and Tares, Oat and Tare Hay, and Oat and Tare Silage. *Ibidem*, Vol. XII, Part 2, pp. 144-145. April 1922.

1209.—**Experiments With Milking Machines.** I. CHRISTENSEN, A., Description of the milking machines tested—II. LUND, A.V., Experiments with milking machines—III. THOLSTRUP PEDERSEN, The Content of Bacteria in the machine-milked Milk, 108th *Compte rendu du Laboratoire experimental de l'Academie Royale veterinarie et agricole danoise*, a communication by Baron Rosenkrantz, International Institute of Agriculture, Danish Office.

1211.—**Experiments in Electro-Culture.**—*Bulletin officiel de la direction de recherches scientifiques et industrielles et des inventions, Year 32*, pp. 360-482. Paris, June, 1922.

1230.—**The Production of Sauerkraut.**—I. BRUNKOW, O. R., PETERSON, W. H., and FRED, E. B., The Influence of certain factors upon the chemical composition of Sauerkraut, in *The Journal of the American Chemical Society*, Vol. 43, No. 10, pp. 1244-1255, Easton, Pa., Oct. 1921.—II. FRED, E. B., and PETERSON, W. H. (*Ibidem*), The Production of Pink Sauerkraut by Yeasts, in *Journal of Bacteriology*, Vol. 7, No. 2, pp. 257-269. Bibliography of 10 publications. Baltimore, March 1922.

1248.—**White Settlement and World Agriculture.**—TAYLOR, G., The Institution of Future White Settlement, A World Survey Based on Physiographic Data, in *The Geographical Review*, Vol. XII, No. 3, pp. 375-402. New York, N.Y., July 1922.

1253.—**Effect of Meteorological Factors on the Quality and Quantity of Wheat Produced in Argentina.**—HESSLING, N. A., in *Monthly Weather Review*, Vol. 50, No. 6, pp. 302-308. Washington, June 1922.

1254.—**Effect on the Yield of Wheat of Variations in the Degree of Humidity of the Soil During and After the Critical Period.**—AZZI, G., in *Il Coltivatore*, Year 68, No. 28, pp. 1-7. Casale Monferrato, Oct. 1922.

1257.—**The Aeration of Soil as an Ecological Factor.**—LARSGUWNER, R., in *Meddelanden fran Statens Skogsforsoksanstalt*, Vol. XIX, No. 2, pp. 125-359, bibliography of 24 works. Stockholm, 1922.

1258.—**The Effect of Soil Drying Upon Soluble Soil Constituents.**—GUSTAFSON, A. P., in *Soil Science*, Vol. XIII, No. 3, pp. 173-213. Bibliography of 106 works. Baltimore, March, 1922.

1267.—**Biochemical Methods for Determining the Fertility of Soils.**—STOKLASA, J., in *Chemiker-Zeitung*, Vol. 46, No. 91, pp. 681-683. Cothen, Aug. 1, 1922.

1278.—**Progress of Nitrogen Fixation After the War.** HARKER, Y. A., in *Chemical Industry*, Vol. 41, No. 18, pp. 387-390. London, September 30, 1921.

1290.—**Cultivation of Barley in England.**—RUSSELL, E. J., in *Journal of the Institute of Brewing*, Vol. 28, No. 9, pp. 697-713. London, September 1922.

1315.—**Cherry Growing in Wisconsin, U.S.**—ROBERTS, R. H., in *Agricultural Experiment Station of the University of Wisconsin*, Bulletin 344, 30 pp. Madison, June 1922.

1320.—**An Investigation Into the Relation Between Height Growth of Trees and Meteorological Conditions.**—HILAY, W.E., and CANLIFFE, N., in *Oxford Forestry Memoirs*, No. 1. Oxford, 1922.

1339.—**Rearing Young Pigs Without Milk Rations.**—SANDBRINK, in *Zeitschrift fur Schweinezucht*, Year XXIX, No. 8, pp. 116-121. Neudamm, May 1, 1922.

1352.—**Intensive Chicken Rearing.**—PLIMMER, R.H.A., ROSEDALE, J.L., TOPPING, R.B., CEICHTON, A., I. The Vitamin Requirements, Preliminary Experiment.—II. The Effect of "Good" Protein, in *The Biochemical Journal*, Vol. XVI, No. 1, pp. 11-22. London 1922.

1353.—**Piscicultural Value of a Stream.**—JOLYET, A., in *Revue des Eaux et Forets*, Vol. 60, No. 9, pp. 283-296. Paris, September 1922.

1361.—**Value of Animal Products in Relation to Crop Yield Since 1919 in the United States.**—*Weather, Crops and Markets*, Vol. II, No. 11, pp. 220-221. Washington, D.C., September 1922.

1371.—**The Grape Syrups and Preserve Industry.**—BORGHI, M., in *Giornale du Chimica industriale ed applicata*, Vol. 4, No. 9, pp. 396-402. Milan, September, 1922.

1375.—**Bitter Milk at a Late Stage of Lactation.**—PALMER, L. S., in *Journal of Dairy Science*, Vol. 5, No. 2, pp. 201-211. Baltimore, March 1922.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief indication of the contents of the more important articles in the January-March number of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

Agrarian Reform in Eastern Europe.—16 pages. In the various states of Eastern Europe which occupy territories formerly included within the Austrian, Russian, German and Ottoman Empires, there has been a common movement towards the more equal distribution of land. This movement is not collectivist, because the land so distributed is to be held in private ownership.

The article begins with a historical account of the changes in the systems of land tenure in the countries in question. It then deals with the new agrarian laws, most of which were passed in 1919. The laws of Roumania, Poland, and Czechoslovakia are discussed in detail.

In Roumania 12,500,000 acres of arable land have passed from the hands of large owners into those of 1,500,000 of heads of peasant families. When the reform is completely carried through, out of a total of 32,000,000 acres of arable land in Greater Roumania, 29,500,000 acres will have definitely passed into the hands of 4,000,000 peasants, in separate lots varying from 2½ to 12 acres, while 2,500,000 acres will remain in the hands of about 6,000 owners in holdings varying from 250 to 500 acres. It is admitted that for a decade these changes will have the effect of reducing the total production of the country.

The redistribution of the land is proceeding much more slowly in Czechoslovakia and Poland. In the former country a significant result of the new regime will be the nationalization of the forests.

Share Tenancy in Spain.—17 pages. This article deals with the different forms of share tenancy common in Spain. The conditions fixed in the agreements are given in detail, and the effects of the different systems of tenancy on cultivation and production are described.

The Development of Farm Household Management Instruction in Belgium.—13 pages. The system of instruction in farm household management now in force in Belgium has proved to be thoroughly adapted to national requirements. The object of the system is to train the girls of farming families in the duties of their position. The course in the farm household management schools generally lasts two years. The curriculum includes the rudiments of the natural sciences and of the theory of agriculture, market gardening, floriculture, elements of stock breeding, dairying and cheesemaking, domestic economy (cooking, sewing, etc.) child nurture, hygiene, business routine, bookkeeping, and law as applied to every day life. The course includes instruction in theory and practical work.

Travelling farm household management schools have also been established. These schools are set up in rotation, on the application of the communal authorities, agricultural societies, or of private persons. The article describes their working in detail.

The article goes on to describe methods of training those who give the instruction in these schools, and gives an account of the organization of the State Higher Training Institute for Farm Household Management.

The Principal Types of Agricultural Co-operative Society in Italy.—31 pages. Agricultural co-operation has spread very rapidly in Italy during the last twenty years. The following classes of society are discussed in this article: co-operative credit societies; co-operative societies for the purchase of requisites; co-operative societies for production and for the sale of produce; co-operative labour societies; and co-operative landholding societies. The article outlines the characteristics of each group and indicates the development it has attained.

Co-operation in the Argentine Republic.—37 pages. This study presents statistical data for 1920-21 compared with former

years. It describes the rural and urban co-operative societies and indicates the different kinds of societies into which each of the two groups is divided. The article discusses the kind of rural co-operative societies best adapted to Argentine conditions and gives a detailed summary of existing legislation on co-operation. The last sections of the article deal with federations of co-operative societies, and mutual insurance.

Other articles in the January-March number are: The Co-operative Movement in Esthonia; Agricultural Co-operative Credit in France in 1920-21; The Teaching of Co-operation in Germany; The Catholic Agricultural Co-operative Movement in Italy; Agricultural Co-operative Societies in Latvia; Rural Credit Associations in New Zealand; Agricultural Co-operative Credit Societies in Russia; The Financial Guarantee Bank for Agricultural Labourers and Small Holders in Switzerland; The Conversion of Collective Ownership of Land in Algeria into Individual Ownership; Forms of Agricultural Agreement in Cuba; Statistics of The Agrarian Reform in Esthonia; The Work of Colonization in The Italian Colonies; Allotment Gardens in France Since the War.

AGRICULTURAL STATISTICS

THE WORLD'S CEREAL CROPS OF 1923

THE WHEAT REQUIREMENTS AND SUPPLIES FOR THE PRESENT GRAIN YEAR

By T. K. DOHERTY

Around the date a year ago corresponding to the present, (August 23rd) extremely low prices prevailed. Bearish items of crop and trade news were the rule, and there was general discouragement among the Canadian producers who were confronted with a large crop but a demoralized world's market suffering from loudly proclaimed adverse economic conditions and lack of credit in Europe, which were to make imports exceptionally small. It was, however, soon realized that the European crop was 200 million bushels less than in 1921, that Europe's old stocks were low and she was compelled to replenish, that the Southern Hemisphere, from which liberal supplies had come up to that time, was nearing the end of its surpluses, so that the importing world had to depend almost exclusively for several months on the North American shipments. The tide of the market soon changed and a considerably higher range of prices was soon reached and maintained for many months. Last year, while the wheat crop of Europe was deficient, in North America the crops exceeded those of the previous year by 146 millions. This year they are abundant in Europe, but in North America, from the most recent official estimates, they are 86 million bushels less than last year. Is the history of last year's prices going to be repeated for the present season's crops? The situation is much more complicated and confused than a year ago and still is not, from the producers' standpoint, without its strong points, as the accompanying statistics and statements will demonstrate. Only fourteen of the twenty-two European countries have so far issued official reports and these exhibit an increase of 144 million bushels. In the accompanying statistical tables where rough estimates are made for the remaining eight countries, derived from acreage and recently reported conditions, the totals exhibit an increase for Europe of 178 million bushels or within 11 million bushels as much as the record production of 1921. While the world's production on the same basis of official and unofficial estimates shows an increase of 150 million bushels, there is 70 million bushels of a decrease in the five chief exporting countries, even conceding as has been done in the statistical tables, fair increases in the next harvests of South America and Australasia.

Moreover, on the North American continent rust and drought have produced a comparatively large quantity of light and unmerchantable wheat. Evidences of this fact are afforded by recent inspections in Manitoba, Kansas and the Northwestern States. Some interesting facts are furnished by the "Price Current-Grain Reporter" of August 16th, from which it appears that east of the Rockies there is only 13 million bushels over and above actual bread and seed requirements available for export, while the inter-mountain and Pacific Coast States have a surplus of 146 million bushels. Last year the States east of the Rockies had 112 million bushels more than was actually required for home needs, and the far west had 99 million bushels. The greatest reduction in the present year's crop, as compared with last year's is in the States that usually furnish the bulk of the grain that enters into inter-state commerce, and already there is keen competition between the

various mills in all sections of the country for the choice hard winter wheat raised in the southwest and west. It is scarcity of hard winter wheat that perplexes the average miller, as there is a tendency to reduce estimates on account of disappointing threshing returns. This is particularly marked in Kansas where the actual yields are running one or two bushels per acre less than indicated by the Government's conditional figures in July.

The "Price Current-Grain Reporter" goes on to state that, included in the figures of the total surplus east of the Rockies is the Durum wheat, which is not used to any great extent for bread flour in the United States. After eliminating the Durum which is conceded to comprise one-half of the whole exportable surplus, it is doubtful if the entire belt east of the Rockies can spare over 30 million bushels for export, even after cutting down the carry-over to well under last year's holdings. The "Reporter" states that owing to the low price of wheat and high price and scarcity of corn there will probably be a heavier consumption this season than last because of feed and waste and also because some grain will not be threshed. It is, moreover, observed that in the United States and elsewhere the Oriental demand for this Western wheat is active, that the portion of the wheat destined for the European market will arrive as late as January. The bread spring wheat crop in the four northwestern States is heavily short of last year, and northwestern mills will probably be free buyers of strong hard winter wheat in the southwestern States throughout the year, and eastern mills will have to import Canadian hard winter, duty paid, in order to be assured of supplies. It may be incidentally mentioned that Canadian exports to the American mills during the past grain year, notwithstanding the duty, amounted to 17 million bushels.

In a despatch from Washington dated August 20th it was stated that, in line with a movement of the U.S. Department of Agriculture to get U. S. farmers to reduce wheat acreage, the American Farm Bureau Federation is advising a cut of at least 20% in the sowing of winter wheat. A recent survey by the Department indicated farmers were actually reducing acreage this fall about 15%. Assuming the estimate of the Agricultural Department of 39 million acres of wheat to be correct on the basis of 14 bushels per acre, there would be a crop of 549 million bushels next year compared with 568 million this year and 590 million the five-year average.

The world's visible supply as of the 1st of August, compiled from various expert sources and published in detail in the "Chicago Daily Trade Bulletin" of August 16th, amounted to 161 million bushels against 124 million last year, an increase of 37 million, represented in good part by the increased stocks of the United States which were about 73 million bushels, compared with 44 last year, while Canada's were only 14 million bushels compared with 19 million the preceding year.

Canada has had signal success in the disposal of its last wheat crop. Taking the international grain year August 1st to July 31st and allowing a 5 per cent deduction for screenings, waste and unmerchantable wheat also 24,327,000 bushels of a carry-over, Canada had 402,320,000 bushels to dispose of. 279 million bushels of this was exported and, after allowing 92 million bushels for food and seed, there apparently remains on August 1st a surplus of 31,320,000. If it is assumed that as much will be exported in August as in July, that is 16 million bushels, there will remain of the old crop on September 1st only 15 million bushels. On a similar calculation but with no allowance for screenings, waste and unmerchantable wheat, the United States for the same period had a net export of only 199 million bushels with a surplus as of August 1st of about 86 million. It is expedient to recall that for the record crop and grain year 1915-16 the August 1st, 1916, surplus stood for the United States at 153,978,000 bushels, and for Canada at 48,579,000 bushels. During August of that year Canada shipped 23 million, leaving on September 1st 25 million, while in the same time the United States shipped only 15 million.

Speaking of the present season, the crop of India harvested in April last, at first reported at 426 million bushels, has dwindled to an official estimate of 369 million, and the 20 odd million of exports for the last grain year are not likely to be exceeded in the next. The exports of Argentina on December 31st last amounted to 28,736,000 bushels and from that date to August 1st instant to something over 114 million, making a total of about 144 million for the whole grain year. Then, against a surplus of over 40 million bushels on August 1st last year she had only about 20 million bushels on the same date this year. The official report issued on July 3rd was 36,800,000 and exports during July were probably the average of the immediately preceding months, or something over 16 million bushels. Australia's surplus at the beginning of August was officially given as only 8 million bushels. This clean-up of stocks in the Southern Hemisphere so early in the calendar year is probably a record performance. The world's exports have recently dwindled very materially and the floating supply on August 1st was reduced by 10 million bushels as compared with the same date the previous year. Quite apart from the consideration of lessened demand this situation may result from the fact that the exporting countries have very little wheat of merchantable quality from the old crop.

The result of the whole situation briefly described is to leave Canada in an exceptionally advantageous position, the full benefit of which she is very likely to reap. She is in a position to practically control the world's exports for the next five months.

The chief difficulty to surmount in calculating the total world import for the present grain year is the apparent crippling of Germany's purchasing power through adverse exchange, which she is at the present moment so intently engaged upon remedying, also the European unsettlement due to the occupation of the Ruhr, and the pending reparations issue. There is, however, the fact of which Mr. Poincare recently gave a reminder, that England, our best customer, has recently increased her trade and lessened unemployment. These improved conditions must be pretty general, otherwise a satisfactory account cannot be given of the increased exports in general of Canada and the United States with England and the rest of Europe. These increased exports imply increased power to make payment. The very fact that Europe has better crops this season tends further to increase that power and the general standard of living which means still larger imports.

Mr. George Broomhall's estimate of the prospective wheat imports of Europe at 532 million bushels we agree with in the main, although it probably concedes too little to a few of the importing countries, but we differ from his expectation that the imports outside of Europe will be only 100 million bushels which in the last year probably exceeded that amount. China, Japan and the smaller countries in the Orient are less and less able to supply their own needs because of their increasing preference for white bread and the lack of land for the cultivation of wheat, and the exports from the American Pacific Coast this season will probably be exceptionally large. Our detailed statement as follows for European needs may not be far astray:

	Million Bushels
Great Britain	220
Germany	50
France	35
Italy	80
Belgium	38
Denmark	7
Sweden	10
Norway	6
Netherlands	24
Finland	5
Greece	13
Switzerland	16
Austria	13
Czechoslovakia	5
Spain	10
Portugal	6
Total	538

To this is to be added at least 110 million bushels for ex-European takings which are usually only in part recorded in available statistics which would make a total of world imports of about 648 million bushels. In order to meet this demand and allowing for the usual loss of quantity and weight in transit there would have to be recorded exports of about 668 million bushels.

On July 24th Mr. George Broomhall (and other distinguished statisticians, who have been very pessimistic as to the tendency of prices, seem to agree with him) published the following estimate of the prospective available export surpluses of the leading countries:

	Million Bushels
Canada	360
United States	208
Argentina	144
Australia	80
India	56
Total	848

From our accompanying tables of production and trade anyone can readily infer that this statement presents grossly exaggerated expectations. Dealing with these countries only and omitting Roumania and Hungary which shipped 10 million bushels last year the following is a statement of their net shipments during the grain year which closed on August 1st instant.

	Million Bushels
Canada	279
United States	199
India	21
Australia	53
Argentina	144
Total	696

There is no probability that these same five countries can spare the same quantity in the coming year and retain normal surpluses at the close. The following statement appears near the limit of probability:

	Million Bushels
Canada	260
United States	180
Argentina	120
Australia	50
India	20
Total	630
to which add	
The Balkans	20
Russia	15
North Africa	10
Total	675

These exports if realized would supply the demand and make up the reduction

of 10 million bushels in the floating supply on August 1st, 1923, as compared with August 1st, 1922.

Then, assuming the Canadian crop to be as large as last year's, owing to the low quality of a considerable proportion of the Manitoba and southeastern Saskatchewan crop, it is improbable that there will be as large a quantity of exportable grades available as last year. The same observation may, with greater force, be applied to a considerable portion of the U.S. crop. It may be applied to some extent to the crop of our biggest customer, England, whose crop is turning out of disappointing quality for milling purposes and therefore justifies our estimating that her imports will exceed those of last year.

WORLD'S PRODUCTION OF WHEAT

Countries	Area			Production		
	1923	1922	1921	1923	1922	1921
	Acres	Acres	Acres	Bushels	Bushels	Bushels
EUROPE:—						
Great Britain and Ireland..	1,900,000	2,073,000	2,076,000	61,000,000	65,249,000	73,795,000
France	13,660,000	13,072,000	13,300,000	290,000,000	243,317,000	323,470,000
Germany.......	3,200,000 (a)	3,396,000	3,562,000	95,000,000 (a)	71,934,000	107,824,000
Belgium	340,000	300,000	344,000	12,589,000	10,615,000	14,495,000
Netherlands....	160,000 (a)	156,000	180,000	6,687,000	5,236,000	8,425,000
Denmark..	235,000 (a)	237,000	220,000	11,000,000 (a)	9,249,000	11,145,000
Norway.	35,000 (a)	25,000	41,000	900,000 (a)	643,000	972,000
Sweden	360,000 (a)	356,000	360,000	12,000,000 (a)	9,381,000	12,577,000
Finland.........	31,000	22,000	20,000	420,000	296,000	280,000
Spain..	10,379,000	10,309,000	10,386,000	142,070,000	125,470,300	145,151,000
Portugal.......	1,100,000 (a)	1,123,000	1,033,000	9,000,000 (a)	9,782,000	9,418,000
Italy	11,614,000	11,489,000	11,779,000	199,151,000	161,643,000	192,838,000
Switzerland.....	157,000	152,000	173,000	5,034,000	3,571,000	5,284,000
Luxemburg . ..	25,000	23,000	45,000	500,000 (a)	173,000	661,000
Poland . .	2,538,000	2,574,000	2,093,000	53,389,000	42,451,000	37,410,000
Czechoslovakia...	1,483,000	1,527,000	1,556,000	37,000,000 (a)	33,621,000	38,382,000
Austria....... ...	450,000 (a)	460,000	379,000	7,500,000 (a)	7,422,000	6,530,000
Hungary...... ..	3,411,000	2,855,000	2,888,000	62,678,000	54,729,000	52,716,000
Jugoslavia. .. .	3,606,000	3,723,000	3,824,000	50,000,000 (a)	42,248,000	51,810,000
Roumania.	6,257,000	6,548,000	6,149,000	106,557,000	92,008,000	78,564,000
Bulgaria.......	2,259,000	2,226,000	2,361,000	38,783,000	37,705,000	42,510,000
Greece... ...	1,071,000	890,000	988,000	13,356,000	9,553,000	11,170,000
Total Europe...	64,271,000	63,536,000	63,757,000	1,214,614,000	1,036,296,000	1,225,427,000
NORTH AMERICA:—						
Canada	22,169,000	22,423,000	23,261,000	382,514,000	399,786,000	300,858,000
United States ..	58,253,000	61,230,000	63,696,000	793,000,000	862,000,000	814,905,000
Total North America...	80,422,000	83,653,000	86,957,000	1,175,514,000	1,261,786,000	1,115,763 000
ASIA:—						
India..........	30,492,000	28,485,000	25,783,000	369,274,000	367,135 000	250,356,000
Japan...........	1,199,000	1,229,000	1,264,000	26,485,000	27,617,000	26,921,000
Total Asia....	31,691,000	29,714,000	27,047,000	395,759,000	394,752,000	27 ,277,000
AFRICA:—						
Algeria	2,795,000	3,103,000	2,816,000	38,383,000	18,233,000	33,764,000
Egypt.	1,500,000 (a)	1,518,000	1,458,000	40,304,000	36,648,000	37,011,000
Morocco........	2,318,000	2,068,000	1,790,000	23,549,000	12,894,000	23,220,000
Tunis...	1,112,000	882,000	1,500,000	9,406,000	3,674,000	10,623,000
South Africa.....	850,000 (a)	839,000	867,000	7,000,000 (a)	6,696,000	8,689,000
Total Africa....	8,575,000	8,410,000	8,431,000	118,642,000	78,145,000	113,307,000
SOUTH AMERICA:—						
Argentina........	16,500,000 (a)	15,940,000	13,927,000	200,000,000 (a)	189,047,000	180,642,000
Chili...........	1,300,000 (a)	1,285,000	1,296,000	23,000,000 (a)	23,815,000	22,179,000
Uruguay.........	500,000 (a)	494,000	812,000	8,000,000 (a)	3,674,000	9,944,000
Total South America.....	18,300,000	17,719,000	16,035,000	231,000,000	216,536,000	212,765,000
AUSTRALASIA:—						
Australia........	10,000,000 (a)	9,960,000	9,719,000	110,000,000 (a)	107,263,000	132,285,000
New Zealand.....	300,000 (a)	283,000	353,000	8,000,000 (a)	8,500,000	10,565,000
Total Australasia.........	10,300,000	10,243,000	10,072,000	118,000,000	115,763,000	142,850,000
WORLD'S TOTAL.	213,559,000	213,275,000	212,299,000	3,253,529,000	3,103,278,000	3,087,389,000

(a) Estimates based on official reports of crop conditions, and on unofficial reports.

MONTHLY EXPORTS OF WHEAT AND FLOUR
1922–23

Months	Canada	United States	India	Australia	Argentina	Total
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
1922-23						
August	14,247,000	38,966,000	10,000	2,517,000	8,719,000	64,459,000
September	12,372,000	31,839,000	8,000	1,960,000	4,800,000	50,934,000
October	41,442,000	25,077,000	34,000	1,254,000	5,202,000	73,009,000
November	60,781,000	17,579,000	1,900,000	1,081,000	5,831,000	87,172,000
December	47,251,000	16,428,000	2,298,000	1,919,000	5,836,000	73,732,000
January	14,354,000	12,519,000	2,618,000	8,818,000	12,583,000	50,892,000
February	10,637,000	12,198,000	1,272,000	5,855,000	18,494,000	48,456,000
March	12,108,000	10,725,000	1,079,000	8,787,000	18,042,000	50,741,000
April	8,889,000	10,195,000	2,327,000	6,484,000	17,265,000	45,160,000
May	14,833,000	14,396,000	3,533,000	5,047,000	15,860,000	53,699,000
June	26,300,000	12,881,000	3,000,000 (a)	5,000,000 (a)	16,000,000 (a)	63,181,000
July	16,153,000	12,000,000 (a)	3,000,000 (a)	5,000,000 (a)	16,000,000 (a)	52,153,000
Totals	279,367,000	214,803,000 (b)	21,081,000	53,712,000	144,632,000	713,588,000 (b)

(a) Estimated.
(b) From this must be deducted 17,000,000 bushels the United States imports from Canada.

RYE, BARLEY, OATS AND CORN (1)

Official estimates of the 1923 production of cereals other than wheat have been issued by about only half of the producing countries of the northern hemisphere, but since most of the more important countries have reported a good idea of the outlook for the present grain year may be deducted.

Rye.—Estimates for 12 countries have been published showing a total of 427,350,000 bushels against 426,639,000 last year. All the European countries reported show increases, that in Poland being 22,000,000 bushels, Canada shows a decrease of 3,500,000 bushels, and the United States one of 30,000,000 bushels.

During the grain year 1922-23 Canada exported over 9,000,000 bushels of rye and the United States 51,000,000. Canada's exports went chiefly to Great Britain, Germany and the Netherlands, while the United States exported chiefly to Germany, Netherlands and Norway, in the order named.

Barley.—Fifteen countries have a total production of 666,000,000 bushels against 592,000,000 last year. In Europe there is an increase in every country so far reported. Canada shows a decrease of 4,000,000 bushels, and the United States an increase of 16,000,000. There is also a large increase in Algeria.

During the twelve months ended July, North America and the Danubian countries (chiefly Roumania) have together supplied about 85 per cent of the world's shipments of barley, the former accounting for just under 40 per cent., and the latter for about 45 per cent. Canada exported 12,000,000 bushels and the United States 18,000,000. Canada's exports are chiefly to Great Britain, with a fair amount to Belgium and the Netherlands. The United States exported mostly to Great Britain, Belgium and Denmark.

Oats.—Reports have been received from 13 countries giving a total of 2,095,000,000 bushels against 1,978,000,000 in 1922. Most of the countries of Europe show increases. Canada has a decrease of 43,000,000 bushels, and the United States an increase of 115,000,000 bushels.

As in the case of barley a large proportion of the world's shipments of oats are from Canada and the United States, these countries having supplied about 45 per cent of the total during the 12 months ended July 1923. Canada exported in that time 24,000,000 bushels chiefly to Great Britain, Belgium and the Netherlands, and the United States exported 18,600,000 bushels chiefly to Great Britain, Belgium, Italy and France.

Corn.—The production of corn in the United States is estimated as 2,982,000,000 bushels against 2,891,000,000 last year, an increase of 90,000,000 bushels. The preliminary estimate of the crop of Canada is 15,351,000 bushels against 13,798,000 last year. In 1922 Canada imported 10,000,000 bushels of corn from the United States.

(1) See tables on pages 489, 490.

Countries	Area 1923	Area 1922	Area Average 1917 to 1921	Production 1923	Production 1922	Production Average 1917 to 1921
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Belgium	557,000	531,000	535,000	19,537,000	18,284,000	17,982,000
Bulgaria	457,000	442,000	465,000	8,480,000	7,453,000	6,186,000
Spain	1,755,000	1,757,000	1,803,000	30,310,000	26,252,000	26,779,000
Jugoslavia	395,000	499,000	475,000	...	4,443,000	5,953,000
Finland	583,000	578,000	596,000	8,545,000	7,775,000	9,521,000
France	2,172,000	2,196,000	2,128,000	...	38,412,000	35,700,000
Greece	217,000	198,000	222,000	2,662,000	2,362,000	3,151,000
Hungary	1,650,000	1,340,000	1,408,000	27,443,000	25,148,000	21,856,000
Italy	321,000	320,000	316,000	6,693,000	5,563,000	5,675,000
Latvia	618,000	584,000	561,000	10,236,000	6,845,000	9,806,000
Lithuania	1,392,000	1,369,000	1,196,000	...	59,963,000	18,336,000
Poland	11,568,000	11,225,000	9,619,000	219,250,000	197,394,000	175,860,000
Roumania	456,000	659,000	793,000	...	9,206,000	9,263,000
Switzerland	47,000	55,000	51,000	1,575,000	1,693,000	1,576,000
Czecho slovakia	2,127,000	2,174,000	2,202,000	...	51,098,000	43,338,000
Canada	2,018,000	2,105,000	803,000	27,819,000	32,373,000	11,066,000
United States	5,234,000	6,210,000	5,465,000	64,800,000	95,497,000	70,426,000
Totals for countries having estimates for 1923	31,567,000	32,242,000	28,638,000	427,350,000	426,639,000	359,884,000

BARLEY

Countries	Area 1923	Area 1922	Area Average 1917 to 1921	Production 1923	Production 1922	Production Average 1917 to 1921
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Belgium	93,000	80,000	88,000	4,223,000	3,438,000	4,306,000
Bulgaria	531,000	534,000	539,000	12,282,000	11,941,000	8,970,000
Spain	4,151,000	4,082,000	4,225,000	91,731,000	77,534,000	86,010,000
Jugoslavia	488,000	941,000	918,000	...	10,523,000	13,289,000
Finland	277,000	297,000	290,000	4,644,000	4,557,000	4,810,000
France	1,592,000	1,713,000	1,607,000	...	40,909,000	34,329,000
Hungary	1,176,000	1,130,000	1,225,000	23,502,000	22,170,000	21,540,000
Italy	568,000	576,000	530,000	10,105,000	8,254,000	9,022,000
Lithuania	419,000	417,000	395,000	...	10,725,000	6,097,000
Poland	2,966,000	2,825,000	2,609,000	66,222,000	59,559,000	58,151,000
Roumania	...	4,269,000	3,669,000	...	94,780,000	56,430,000
Switzerland	15,000	16,000	19,000	551,000	482,000	631,000
Czechoslovakia	1,686,000	1,668,000	1,662,000	...	46,352,000	42,355,000
Canada	2,563,000	2,600,000	2,708,000	67,545,000	71,865,000	62,350,000
United States	7,980,000	7,390,000	8,032,000	202,000,000	186,110,000	192,000,000
Japan	2,516,000	2,746,000	2,912,000	81,369,000	87,138,000	92,073,000
Algeria	2,827,000	2,868,000	2,717,000	46,316,000	18,805,000	34,886,000
Egypt	...	375,000	385,000	11,374,000	11,306,000	11,189,000
Morocco	2,867,000	2,548,000	2,246,000	32,734,000	27,230,000	32,805,000
Tunis	988,000	603,000	1,173,000	11,482,000	1,837,000	8,102,000
Totals for countries with estimates for 1923	33,703,000	33,034,000	33,895,000	666,080,000	592,226,000	626,845,000

Countries	Area			Production		
	1923	1922	Average 1917 to 1921	1923	1922	Average 1917 to 1921
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Belgium	652,000	717,000	583,000	....	33,667,000	30,259,000
Bulgaria	344,000	352,000	338,000	9,461,000	8,606,000	6,429,000
Spain	1,514,000	1,514,000	1,533,000	34,813,000	29,378,000	31,970,000
Finland	1,038,000	988,000	1,045,000	24,435,000	26,540,000	23,132,000
France	8,540,000	8,492,000	7,999,000	.....	271,311,000	224,531,000
Greece	180,000	....	186,000	5,613,000	....	3,811,000
Hungary	856,000	818,000	844,000	22,930,000	21,227,000	20,834,000
Italy	1,211,000	1,214,000	1,184,000	34,366,000	28,673,000	33,701,000
Lithuania	773,000	769,000	704,000	....	27,240,000	14,962,000
Poland	6,225,000	5,879,000	5,050,000	179,386,000	162,469,000	147,025,000
Switzerland	49,000	51,000	64,000	2,853,000	2,321,000	3,448,000
Czechoslovakia	2,063,000	2,017,000	1,967,000	....	67,344,000	62,938,000
Canada	15,519,000	14,541,000	15,171,000	448,659,000	491,239,000	436,128,000
United States	40,768,000	40,693,000	42,776,000	1,316,000,000	1,201,000,000	1,378,000,000
Algeria	596,000	583,000	586,000	12,323,000	5,243,000	12,818,000
Morocco	32,000	28,000	21,000	1,083,000	169,000	368,000
Tunis	124,000	112,000	152,000	3,112,000	746,000	3,197,000
Totals for countries with estimates for 1923	80,484,000	78,768,000	80,203,000	2,095,034,000	1,977,611,000	2,100,861,000

CORN

Countries	Area			Production		
	1923	1922	Average 1917 to 1921	1923	1922	Average 1917 to 1921
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Bulgaria	1,199,000	1,313,000	1,415,000	....	....	....
France	781,000	790,000	796,000	....	....	....
Italy	3,707,000	3,811,000	3,821,000	....	....	....
Switzerland	4,000	4,000	6,000	157,000	185,000	284,000
Czechoslovakia	403,000	392,000	377,000	....	....	....
Canada	307,000	318,000	266,000	15,351,000	13,798,000	13,631,000
United States	103,112,000	102,428,000	102,882,900	2,982,000,000	2,891,000,000	2,931,000,000
Algeria	12,000	19,000	19,000	276,000	276,000	268,000
Totals	109,525,000	109,075,000	109,584,000	2,997,784,000	2,905,259,000	2,945,183,000

POTATOES

Countries	Area			Production		
	1923	1922	Average 1917 to 1921	1923	1922	Average 1917 to 1921
	Acres	Acres	Acres	Bushels	Bushels	Bushels
Belgium	374,000	445,000	391,000	....	....	....
Bulgaria	24,000	20,000	20,000	....	....	....
Finland	168,000	185,000	202,000	17,254,000	16,009,000	17,775,000
France	3,560,000	3,619,000	3,485,000	....	....	....
Italy	890,000	861,000	822,000	....	....	....
Lithuania	328,000	326,000	304,000	....	....	....
Poland	5,642,000	5,409,000	4,920,000	....	....	....
Czechoslovakia	1,574,000	1,607,000	1,534,000	....	....	....
Canada	656,000	684,000	740,000	93,751,000	92,908,000	110,200,000
United States	3,892,000	4,331,000	3,906,000	380,000,000	451,000,000	388,000,000
Algeria	46,000	42,000	41,000	2,205,000	2,146,000	1,317,000
Totals	17,154,000	17,529,000	16,365,000	493,210,000	562,063,000	517,292,000

FOREIGN CROP CONDITIONS

(August 20, 1923)

France.—Towards the end of July harvesting was in full swing, and favoured by warm sunny weather. Wheat is threshing out well, the yields exceeding those of last year by more than 15 per cent. Private forecasts of the wheat production vary from 275 to 308 million bushels. Practically all authorities are agreed that little foreign wheat will be required in 1923-24 outside the usual quantities of strong wheats.

Germany.—Warm, sunny weather prevailed in the latter part of July and crops were ripening rapidly.

Austria.—Harvesting was progressing under favourable conditions, and winter cereals were expected to yield exceptionally well.

Jugoslavia.—Harvesting was proceeding under excellent weather conditions. Wheat yields are very good and a fair surplus for export is expected.

Denmark.—Recent weather was favourable and a good crop is expected.

Russia.—The *Ost Express* in a despatch from Moscow dated July 26th, gives the following information. The Central Statistical Bureau of the Soviet Federation describes the harvest prospects as almost satisfactory and estimates the crops as follows, in tons: Important grain crops, 39,400,000; other kinds of grain, 3,770,000 potatoes, 9,858,000. The foregoing items make a total of about 53 million tons, compared with 36 millions in 1922, 34,500,000 in 1921, 41,900,000 in 1920, and 66,000,000 in 1913. The surplus for the current year is estimated at 8,200,000 tons. The surplus mentioned is large, and even if we reduce it by one-half to allow for exaggeration, difficulties of transport, the inclusion of oil-seeds and oilcakes, etc., yet even then there is indicated a substantial quantity of grain, totalling nearly 20,000,000 quarters. We need hardly say that all kinds of grain are included in the official estimate, and at present we do not change our opinion that wheat shipments are likely to be small.

The following statement gives some idea of the reverse side of the glowing picture which the Soviets are so fond of painting:—In conversation with a number of the All-Ukrainian Grain Traders, Comrade Kuznetzov remarked that the hopes expressed at the conference of grain traders regarding grain exports were undoubtedly exaggerated. He said that in the end exports will depend upon the development of the trade inside the country. With the opening of the new season considerable technical difficulties connected with adequate receiving points and inadequate transport organization would have to be overcome. The problem for the moment, said Comrade Kuznetzov, was to find a market for the peasants' produce in order that they could acquire needed machinery and fulfil their tax obligations.

North Africa.—Threshing has made good progress. In the west and centre of Algeria good yields are confirmed, but in the east and in parts of Tunis results are less satisfactory. In Morocco the hard wheat crop has yielded well.

India.—The monsoon is vigorous and has given further good rains in all provinces except Sind.

Argentina.—Cool, rainy weather prevailed in the last week of July. All crops promise well. There are further reports of a large acreage sown to wheat.

Australia.—Further good rains are reported and prospects for the wheat crop are good.

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

Products, Markets and Descriptions	6 July 1923	1 June 1923	7 July 1922	Aver. 1913
WHEAT				
(cents per 60 lbs.)				
Canada:				
Winnipeg: No. 1 Manitoba	110	108	135	88
United States:				
Chicago: No. 2 Winter	$104\frac{1}{4}$	$111\frac{1}{2}$	$116\frac{1}{4}$	$90\frac{1}{4}$
Minneapolis: No. 1 North	112	115	137	$87\frac{5}{8}$
New York: No. 2 Winter	122	130	$130\frac{3}{4}$	$97\frac{1}{4}$
India:				
Karachi: Karachi white	108	110	129	91
Argentina:				
Buenos Aires: Barletta	110	113	126	100
Germany:				
Berlin: Home grown	131	45	132	128
Belgium:				
Antwerp: Home grown	148	137	157	104
France:				
Paris: Home grown	156	167	181	146
Great Britain:				
London: English	138	125	151	104
Liv. and Lond.: No. 1 Man	129	135	159	110
Liv. and Lond.: No. 2 Win	119	134	136	109
Liv. and Lond.: Pacific	129	139	146	111
Liv. and Lond.: Plate	126	134	143	108
Liv. and Lond.: Australian	134	145	147	117
Liv. and Lond.: C. W. Kar	129	139	n.q.	110
Italy:				
Milan: Home grown soft	130	142	150	148
Netherlands:				
Rotterdam: Home grown	......	n.q.	149	115
RYE				
(cents per 56 lbs.)				
United States:				
Minneapolis: No. 2	62	64	81	$56\frac{5}{8}$
Germany:				
Berlin: Home grown	87	35	93	101
Belgium:				
Antwerp: Home grown	85	94	132	80
France:				
Paris: Home grown	n.q.	91	108	97
Netherlands:				
Rotterdam: Home grown	......	n.q.	122	86

Ocean Rates of Freight, and Voyages	6 July 1923	1 June 1923	7 July 1922	Aver. 1913
OCEAN RATES OF FREIGHT (WHEAT AND MAIZE)				
(cents per 100 lbs.)				
Rumania:				
Danube to U.K.	16	19	18	11
Danube to Genoa	15	18	16	10
Canada:				
Canada to U.K.	14	14	15	14
United States:				
New York to Liverpool	7	7	9	10
North Range to U.K. Cont.	13	13	14	13
North. Range to Genoa	18	17	18	20
North Pacific Ports to U.K.	38	39	37	43
Argentina:				
Plate Down River-U.K.	20	26	20	18
Plate Up River-U.K.	22	28	22	20
India:				
Karachi to U.K.	28	27	17	20
Rangoon to U.K.	n.	31	22	29
Australia:				
Australia to U.K.	33	35	38	34
COTTON FREIGHTS				
(cents per 100 lbs.)				
United States:				
New York to Liverpool	20	20	25	30
New Orl. to Liverpool	n.q.	n.q.	50	43

INDEX NUMBERS OF THE PRICE OF WHEAT

Dates	WHEAT									
	EXPORTING MARKETS				IMPORTING MARKETS					
	Canada WINNIPEG — No. 1 Manitoba	*United States* CHICAGO — No. 2 Winter	*India* KARACHI — Karachi white	*Argentina* BUEN. AIRES — Barletta	*Germany* BERLIN — Home grown	*Belgium* ANTWERP — Home grown (Märkischer)	*France* PARIS — Home grown	*Great Britain* LONDON — Home grown	*Italy* MILAN — Home grown soft	*Netherlands* ROTTERDAM — Home grown
Average 1913	100	100	100	100	100	100	100	100	100	100
11 July 1913...	110·8	98·3	100·3	102·9	102	107·9	103·7	102·1	103·2	109·8
14 July 1922..	154·8	130·2	162·0	152·0	10,524	(1) 348·5	296·2	157·2	443·1	134·2
4 May 1923. .	135·4	134·6	137·5	140·5	747,331	434·3	334·8	134·4	407·5	122·3
11 May 1923...	132·7	132·7	133·0	137·6	762·583	429·3	340·2	132·3	407·5	120·4
18 May 1923...	133·2	134·6	132·2	137·6	874,428	429·3	337·5	127·1	400·4	122·1
25 May 1923...	134·7	135·2	133·0	137·6	981,190	429·3	347·4	126·0	400·4	... ...
1 June 1923...	126·1	123·5	127·3	138·2	1,296,390	459·6	340·2	126·0	395·0	n.q.
8 June 1923...	131·4	124·1	128·1	137·6	1,382,816	459·6	337·5	135·4	393·2	n.q.
15 June 1923...	135·2	126·0	128·9	137·0	1,814,947	464·6	344·7	136·5	389·7	143·7
22 June 1923..	133·2	118·6	127·3	136·4	2,440,264	535·4	344·2	136·5	393·2	154·5
29 June 1923.	126·6	115·2	124·8	134·7	3,126,589	555·6	341·1	137·5	393·2	154·5
6 July 1923...	127·7	115·5	125·6	134·1	4,295,882	555·6	350·1	141·7	393·2	.... .
13 July 1923. .	122·2	112·6	121·5	132·9	......	555·6	349·6	141·7	359·4	..... .

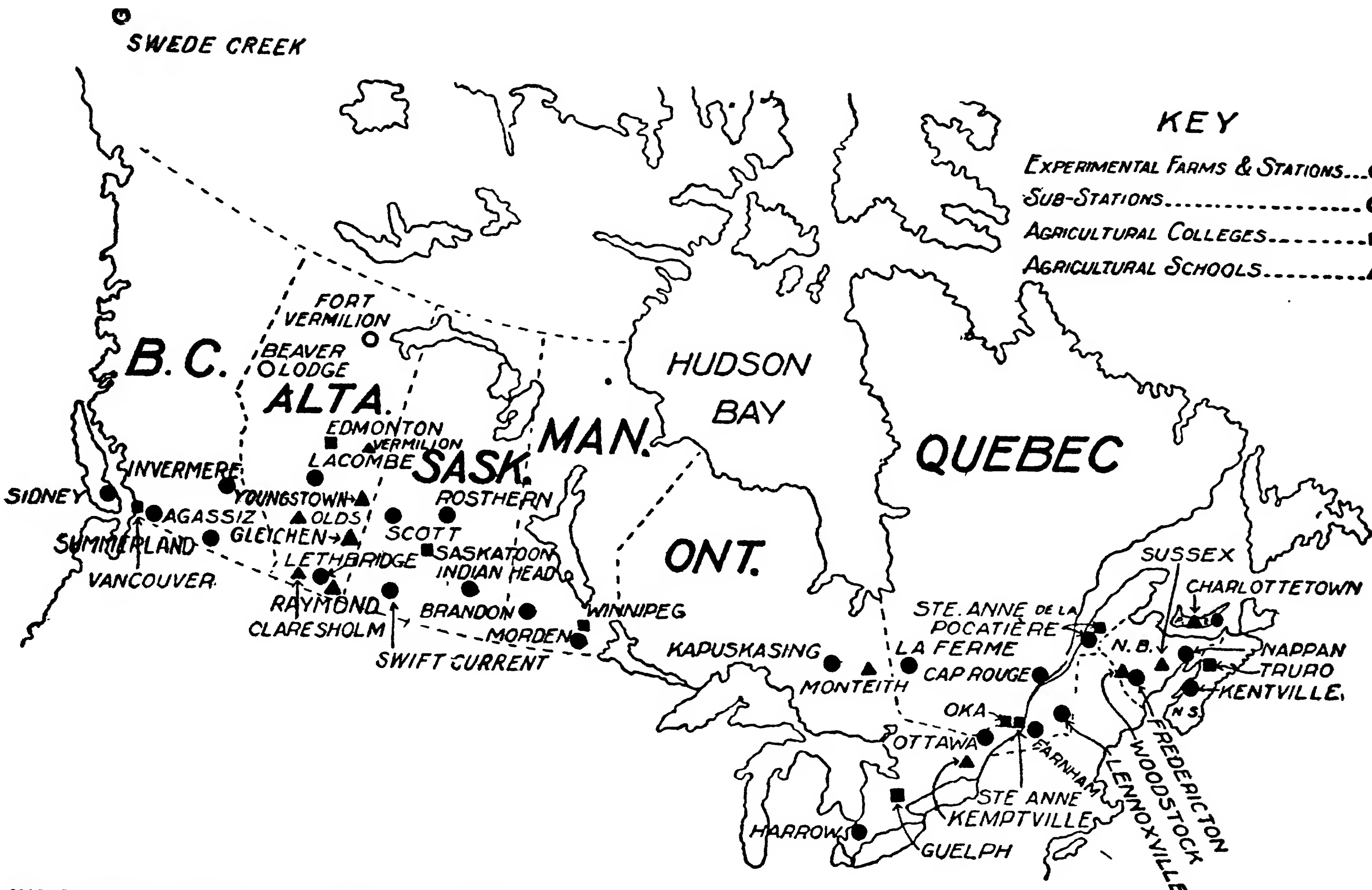
DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 10: No. 6 November-December, 1923

The AGRICULTURAL GAZETTE OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA



MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART I

DOMINION DEPARTMENT OF AGRICULTURE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

PART III

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS. PUBLICATIONS AND NOTES

PART V

INTERNATIONAL INSTITUTE OF AGRICULTURE

THE AGRICULTURAL GAZETTE OF CANADA

The AGRICULTURAL GAZETTE
OF CANADA

VOL. X | NOVEMBER-DECEMBER, 1923 | No. 6

CANADIAN WHEAT AND WHEAT FLOUR

The Crop

THE bulk of Canada's wheat is grown in the three Prairie Provinces of Manitoba, Saskatchewan and Alberta. More than half the total is the product of a single province—Saskatchewan. According to the preliminary estimate of the Dominion Bureau of Statistics, the total wheat production in bushels of the three provinces in 1923 was 446,775,000, and for the rest of Canada 23,553,000, making a total of 470,328,000, or the largest wheat crop ever grown in this country. By provinces, production in 1922 and 1923* was as follows:

Province	1922	1923
	bushels	bushels
Manitoba	60 051 000	38 636 000
Saskatchewan	250 167 000	259 017 000
Alberta	61 976 000	149 122 000
British Columbia	1 035 000	1 194 000
Ontario	19 893 000	19 101 000
Quebec	2 286 000	2 228 000
Nova Scotia	293 600	258 000
New Brunswick	396 000	257 000
Prince Edward Island	688 800	515 000
Total Canada	399 786 400	470 328,000

The total area devoted to field crops in 1922 was 57,200,681 acres, while the area devoted to wheat was 22,422,693 acres in 1922 and 22,730,149 acres in 1923. The total acreage devoted to wheat in the Prairie Provinces in 1923 was 21,663,360 acres, and in 1922, 21,223,448 acres.

The total value of Canada's wheat crop in 1922 was $339,419,000 which was slightly in excess of the average for the previous five years, 1917-21. Of all other field crops the aggregate value was $592,444,670. Thus the value of the wheat produced was considerably more than one-half of all other field crops combined.

Canada's wheat crop in 1915 of 393,500,000 bushels from 15,000,000 acres, went down to history as the largest this country had ever produced up to that time. It was that crop which enabled Canada to greatly augment the food supply of the Allies. Bountiful nature came to the assistance of the Canadian farmer in a wonderful degree in that year of crisis, and while the volume of production was exceeded in 1922, and again in 1923, the 1915 record of 26 bushels per acre still stands, and is likely to do so for some time to come.

For all Canada, the yield per acre in 1922 averaged 17·75 bushels for both spring and fall wheat. For 1923 the average was 20·75 bushels (fall wheat 24·25; spring wheat 20·50). The average for the five years 1917-21

*Preliminary estimate.

was 12·25 bushels for spring wheat and 22·25 bushels for fall wheat, and for both classes, 12·75 bushels, and the decennial average 15¾ bushels. In the same five-year period the average weight per measured bushel was fall wheat 60·13 pounds, spring wheat 58·77 pounds, and of all wheat 59·10 pounds. The average weight per bushel of the spring wheat crop of 1922 was 60·31 pounds.

Relative Position

To what extent is Canada a controlling factor in the production and price of wheat? With a production of approximately 400 million bushels, Canada, in 1922, took second place among the wheat-producing countries of the world, being exceeded only by the United States. In 1923, with a production of 470 million bushels, her position is still maintained.

The relative position in 1922 of the leading wheat-producing countries, Russia not included, as indicated by statistics supplied by the International Institute of Agriculture, was as follows:

Countries	Production bushels
United States	862,000,000
Canada	399,786,000
India	367,135,000
France	243,317,000
Argentina	189,047,000
Italy	161,643,000
Spain	125,470,000
Australia	107,263,000

From the same source, it is ascertained that the world's total production of wheat in 1922 was 3,103,278,000 bushels, of which amount Canada contributed a little more than one-eighth.

PRODUCTION OF WHEAT IN THE BRITISH EMPIRE

Country	1923	1922	1921	Pre-War Average 1909-1913
	bushels	bushels	bushels	bushels
United Kingdom	61,000,000	65,249,000	73,795,000	59,640,000
Canada	470,328,000	399,786,000	300,858,000	197,118,000
India	369,263,000	367,135,000	250,356,000	359,035,000
South Africa	(a)	6,696,000	8,689,000	6,520,000
Australia	(a)	107,263,000	132,285,000	90,500,000
New Zealand	(a)	8,500,000	10,565,000	7,070,000
Totals	....	954,629,000	776,548,000	719,883,000

(a) Harvest to take place in December-January.
Statistics furnished by the International Institute of Agriculture.

Wheat Exports

Canada's position as a producer of wheat has somewhat obscured the far more significant fact that she is the largest single contributor to the world's supply, having more surplus wheat for export than any other wheat-growing country. For the international grain year ended August 1, 1923, Canada exported, according to the International Institute of Agriculture, no less than 279,000,000 bushels of wheat and flour reduced to wheat, compared with 199,000,000 bushels from the United States, 144,000,000 bushels from Argentina, 53,000,000 bushels from Australia, and from India 28,000,000 bushels. Thus to the total of 696,000,000 bushels exported by the leading countries, Canada contributed two-fifths.

For 1923-24 Canada's contribution to the world's requirements is likely to be still greater. Estimating those requirements at 668 million bushels against 700 million taken in 1923, Canada should be in a position to export 300 million bushels, compared with probable shipments from other exporting countries aggregating 375 million bushels, made up of 150 million bushels from the United States, 110 from Argentina, 50 from Australasia; from India, 30; Balkans, 10; *Russia, 15; South Africa, 10.

For wheat the United Kingdom is Canada's best customer. According to the Dominion Bureau of Statistics the exports of wheat for the crop year, September 1, 1922, to August 31, 1923, were 229,681,814 bushels valued at $263,819,430. Of this amount, 174,011,494 bushels went to the United Kingdom and 12,936,048 to the United States. Other countries to which exports were not less than two million bushels were Belgium, France, Greece, Italy, Japan, and the Netherlands.

The following is a statement, by countries, of the quantities of Canadian wheat exported during the years 1921, 1922 and 1923, the fiscal year ending March 31 being taken:

EXPORTS OF CANADIAN WHEAT

Country	1921	1922	1923
	Bushels	Bushels	Bushels
United Kingdom	29 294,612	92,498,351	166,846,960
United States .	42 324,894	16,592,797	16,213,629
Belgium	14 069 843	4,069,245	5,348,388
France	5 051 461	1,111,752	3,188,274
Germany .	1,832,739	1 219,257	1,185,984
Greece	4 667,639	3,794,535	4,055,703
Italy . . .	21,048,458	10,298,424	8,192,537
Japan .		2 425,915	2,610,012
Netherlands .	6 976,125	2,585,885	4,448,610
Sweden	673 443	360,396	889,714
Other Countries	3 275 943	1 532,681	2,094,755
Totals	129 215,157	136,489,238	215,074,566

Flour Milling

With the development of Western Canada, wheat became the chief raw product of Canadian agriculture, and flour and grist milling, always a leading and characteristic Canadian industry, now competes with the meat packing industry for first place among our manufactures in the value of its product.

The growth of the milling industry—flour and grist—since the confederation of the provinces of Canada is indicated by the following figures: In 1871 the amount of capital invested was $10,000,000 compared with $62,000,000 in 1921; the value of the raw materials used was $32,500,000 as against $165,000,000, and the value of the products, $39,000,000 as against $195,000,000. In the same period the quantity of wheat flour exported increased from 300,000 barrels to 6,000,000 barrels, and stood in 1922-23 at 10,000,000 barrels.†

* Estimates of Russia's probable exports are purely tentative but it may be assumed that she will be compelled by circumstances to export a considerable quantity of wheat in 1923-24.

During the grain years 1908-09 to 1912-13, Russia's exports of wheat and flour averaged 151,787,000 bushels.

† "In the crop year 1917-18, Canada supplied the Allies in the Great War 10,000,000 barrels of much needed flour in addition to her exports of wheat." *Essays on Wheat*: Buller.

There are at the present time 624 flour mills in operation in Canada with a total capacity of 128,225 barrels of flour per diem. Of this number 163 are large mills with a combined daily capacity of 110,000, the capacity of the largest being 14,000 barrels.

Flour mills exist in each of the nine provinces. Those of the greatest capacity are located at Montreal, Quebec, at Kenora and Port Colborne, Ontario, and at Winnipeg, Manitoba. It is anticipated that the development of the Pacific trade will stimulate the growth of the industry in Western Canada.

The total quantity of wheat flour produced in Canada in 1921 was 15,321,759 barrels, being the product of 70,000,000 bushels of wheat.

The total annual capacity of Canadian mills is in the neighbourhood of 30 million barrels. This is far beyond the needs of domestic consumption, computed at 8,000,000 barrels annually, and a large portion of the wheat crop is marketed overseas in the form of flour.

Flour Exports

Returns for the crop year 1922-23 (August 31) show that 11,069,054 barrels of Canadian wheat flour valued at $62,891,156 were exported to over fifty countries. As in the case of wheat, the United Kingdom was the largest purchaser, taking 4,697,745 barrels as against 432,607 barrels taken by the United States. Newfoundland and the British West Indies accounted for nearly a million barrels, and various other countries for the remainder.

The total exports of wheat flour for the fiscal years (ended March 31) 1914 and 1919-23 were as follows:

	Barrels
1914	4,832,183
1919	9,205,439
1920	8,863,068
1921	6,017,032
1922	7,414,282
1923	10,227,060

Quality

The quality of Canadian wheat and wheat flour has created a demand from all sections of the globe for these products, her wheat being sold direct to over fourteen countries and wheat flour to over fifty countries.

For ten years in succession Canada succeeded in carrying off the wheat championship of the world, either with the Marquis variety or a variant of it.

The determining factors in the strength of wheat are climate, soil and variety. Hard wheat such as that grown on the central plains of Canada, yields a flour high in protein and produces a very light bread. Soft wheat, produced in moister climates, yields starchy flour, and a bread that is more compact in texture. When mixed with softer wheats, Canadian hard wheat gives " strength " to the flour, which absorbs a high degree of moisture, resulting in a big, bold loaf. For these purposes it is essential, and is equal in value and quality with " Hungarian Hard."

Future Prospects

It has been demonstrated in the foregoing that Canada ranks first as an exporter and second as a grower of wheat. While the increase has been rapid, it would be hazardous to predict that it will continue at its present

rate, in spite of the fact that there are many thousands of acres still available in Western Canada for the production of grain. Further expansion, or even the maintenance of the present volume of production, is dependent primarily on satisfactory profits to the grower. Profits depend upon costs and prices, and prices on the ratio between world supply and demand.

The probability of an increasing surplus from Russia and the necessity of European countries making their purchases in countries where exchange is more nearly on a parity than it is with Canada, are considerations that add to the difficulty in forecasting the future. Nor is the fact to be lost sight of that there is a marked tendency in the Canadian West to turn from wheat to more diversified lines of farming, such as live stock and dairying. Sound principles of husbandry demand this, and while on the one hand the influx of new settlers may increase the area devoted to grain crops, that area may, on the other hand, tend to diminish in well established districts.

Confidence in Canada's ability to meet competition is strengthened by the fact that Canada produces what, on the whole, is the best wheat in the world, having regard to quality, purity and reliability of grade.

Physical Equipment

To convey her surplus products to the world's markets, which for such products as wheat, meat, cheese and butter, lie chiefly overseas, physical facilities of all kinds have been provided, involving a vast expenditure of capital. On land, railways have been built and completely equipped from ocean to ocean; chains of interior grain elevators exist throughout the prairies; gigantic batteries of elevators, or warehouses, have been constructed at railway terminals and transhipping points. To enable advantage to be taken of the inland water highways provided by the Great Lakes and the river St. Lawrence, an extensive system of canals has been constructed, including the Welland Canal, connecting lakes Erie and Ontario, which is second only in magnitude to the Panama Canal. Associated in this has been the development and equipment of ports, harbours and waterways, not to mention a fleet of grain-carrying vessels on the lakes. To facilitate buying and selling the standardization and grading of wheat has been instituted, and a system of financing and marketing has been built up.

To the cultural aspect of wheat growing Canada has made a contribution of untold value in the origination and introduction of varieties particularly adapted to the great plains of the North American continent.

Varieties

The successful development of wheat growing in Western Canada is in a large measure due to the introduction of two superior varieties of wheat found suited to western climatic conditions. The first of these varieties, Red Fife, was discovered fortuitously by a Canadian farmer. The second, Marquis, was originated by the Experimental Farms Branch of the Dominion Department of Agriculture. The introduction of these varieties in Western Canada, and to a wide extent in the spring wheat areas of the United States, has not only improved the quality of the wheat grown, but has increased the yield of this continent by many millions of bushels.

About the year 1842, David Fife, a Scotch pioneer farmer of the province of Ontario (then known as Canada West) selected the variety that bears his name, from seed tracing to Central Europe, and now recognized as

identical with a European variety known as Galician. This proved to be a productive hard spring wheat of fine milling and baking qualities. By 1870, Red Fife had become the spring variety most generally grown in Ontario, and early in the eighties it became the leading variety in Manitoba, replacing the softer varieties. With the settlement of the provinces of Saskatchewan and Alberta, it spread throughout the West, where it was grown almost universally. Marquis, the successor of Red Fife, was selected in 1903 and distributed in 1909 by Dr. Charles E. Saunders, Dominion Cerealist, from

Harvesting grain on a Prairie Farm in Western Canada

among a number of cross-bred varieties originated by the Experimental Farms Branch. The male parent was Red Fife, and the female, Red Calcutta (a type name). This wheat, because of the qualities of its gluten content, was found to produce a remarkably good flour and a large and palatable loaf. Being a better yielder than Red Fife and ripening one week earlier, thus making it less liable to frost and rust, it had in a few years almost entirely superseded its parent variety. To-day, more than 80 per cent of the wheat of Western Canada is Marquis, and in the United States it is the most generally grown spring wheat, occupying in 1919, 11,825,000 acres or 38·8 per cent of the spring wheat area, and 16 per cent of the total wheat area.

The introduction of these two wheats has added greatly to the actual wealth of Canada and the United States, besides contributing materially to the development of the Western Provinces.

Prelude wheat, another variety originated by the Dominion Experimental Farms, was introduced into Manitoba and Saskatchewan in 1911. Prelude is a hard, red, bearded variety of unusual weight, and although not as heavy a yielder as Marquis, it ripens about two weeks earlier. On account of this advantage, it is proving of great value in extending the area of successful wheat growing in the central and northern sections of the Canadian West.

In the northerly extension of the wheat area, another variety originated at Ottawa is also playing a part. This is Ruby, Ottawa, 623, distributed in 1919. Ruby is a hard, red, beardless variety, coming midway in ripening between Marquis and Prelude, and is proving of value in districts where

Marquis does not ripen satisfactorily. Ruby wheat gives a fair yield, and makes flour of the highest quality as regards colour and strength, while bread made from it ranks in the first class.

Grading

All wheat is graded by government inspectors at terminal elevators and sold both at home and abroad on grade certificate. Sample markets serve as a rule only local requirements.

The grades of wheat are defined by The Canada Grain Act. This act, which is administered by a Board of Grain Commissioners, regulates and controls the business of handling wheat and other grain.

The grain inspection service is divided into the Eastern and Western divisions, each being confined to its own territory, but the same system of grading prevails throughout. The grade is determined by the degree of purity, cleanness, soundness, weight, condition, and milling qualities as indicated by the degree of hardness.

The four highest grades are established by statute and do not vary from year to year. The lower, or "commercial grades," of which there are three, cannot be established as they are dependent on the climatic conditions under which the crop is produced. The lower grades are therefore defined annually by the Grain Standards Board. As there is often a spread of several cents between grades, the profitableness of the crop to the grower is dependent in no small degree on the grade range.

To assist the Grain Standards Board in establishing the commercial grades on a scientific basis, a government grain research laboratory has been provided. This laboratory investigates the milling and baking qualities of the crop, as well as specific problems arising from seasonal conditions.

The following table gives the percentages of each of the grades of western spring wheat inspected during the crop years 1920-21, 1921-22 and 1922-23. The amount of winter wheat grown in Western Canada is negligible. The figures quoted were supplied by the Board of Grain Commissioners for Canada:—

Grade	Percentages		
	1920-21	1921-22	1922-23
No. 1 Hard	·09	1·21	·33
No. 1 Northern	38·06	29·87	65·65
No. 2 Northern	23·68	20·30	16·80
No. 3 Northern	24 47	23·81	9 31
No. 4	5·32	8·62	·77
No. 5	·90	2·44	·21
No. 6	·29	·71	·06
Below "Commercial" grade	7·19	13·04	6·87
	100·00	100·00	100·00

The foregoing statement indicates that 86·30 per cent of the Western spring wheat crop of 1920-21, 75·19 per cent of the crop of 1921-22 and 92·09 per cent of the crop of 1922-23 came within the four grades established by statute. The percentage of "commercial" grades was 6·51 in 1920-21, 11·77 in 1921-22 and 1·04 in 1922-23.

As an indication of the magnitude of the work of grading, it may be stated that the quantity of wheat inspected in the Western Division in 1923, was 279,256,700 bushels, comprising 228,659 car loads.

Transportation and Storage

After the crop is harvested and threshed, the farmer delivers it to the country elevator—or loads on cars direct from the station loading platform—whence it is shipped by rail to the terminal elevator. Inspection takes place at the terminal elevators, and there the wheat is classified and stored, sold and shipped, according to grade. The terminal elevators are owned either by the Government or by private concerns. They are located at Port Arthur and Fort William at the head of the lakes and at convenient interior points such as Winnipeg, Moose Jaw, Saskatoon and Calgary. The interior terminal elevators not only provide storage, particularly after lake navigation has ceased, but also facilities for treatment, such as cleaning or drying, when this is required.

Country Grain Elevators at Virden, Manitoba

At the end of 1922 the number of country grain elevators in the three Prairie Provinces was 3,929, and their total capacity, 129,961,420 bushels, by provinces was as follows:*

Province	Number	Capacity
		bushels
Manitoba	693	21,325,100
Saskatchewan	2,304	72,542,320
Alberta	932	36,094,000
Total	3,929	129,961,420

The location and capacity of the principal terminal and public grain elevators at the end of the year 1922 is given as follows:*

—	Number	Capacity
		bushels
Interior Prairie Terminal Elevators		
Winnipeg, (Transcona North Transcona) — Moose Jaw, Saskatoon, Calgary	7	11,835,000
Lake Port Elevators —		
Upper Lakes		
Fort William, Port Arthur..	28	56,810,000
Georgian Bay.		
Goderich, Port McNicoll, Tiffin, Depot Harbour, Midland .	7	13,800,000
Lower Lakes		
Port Colborne, Prescott	3	4,500,000
Atlantic Port Elevators —		
Montreal Quebec, St John, Halifax	10	14,350,000
Pacific Port Elevators		
Vancouver .	1	1 250 000
Total	56	102,545,000

The ownership of the country elevators is in the hands of the farmers' co-operative companies, private elevator companies and milling companies. Among the farmers' organizations in Western Canada, organized for trading in grain and other commodities, are United Grain Growers, Limited, and the Saskatchewan Co-Operative Elevator Company, Limited. . These two companies control not only a large number of country elevators but also storage at the head of Lake Superior, and between them handle a large proportion of the western crop According to information supplied by United Grain Growers, Limited, that organization, in 1923, comprised approximately 35,000 farmer shareholders. It controlled 364 country elevators with a capacity of 10,662,000 bushels, as well as storage capacity for 3,100,000 bushels at terminal points, and in the crop year 1922-23, handled approximately 30 million bushels of grain.

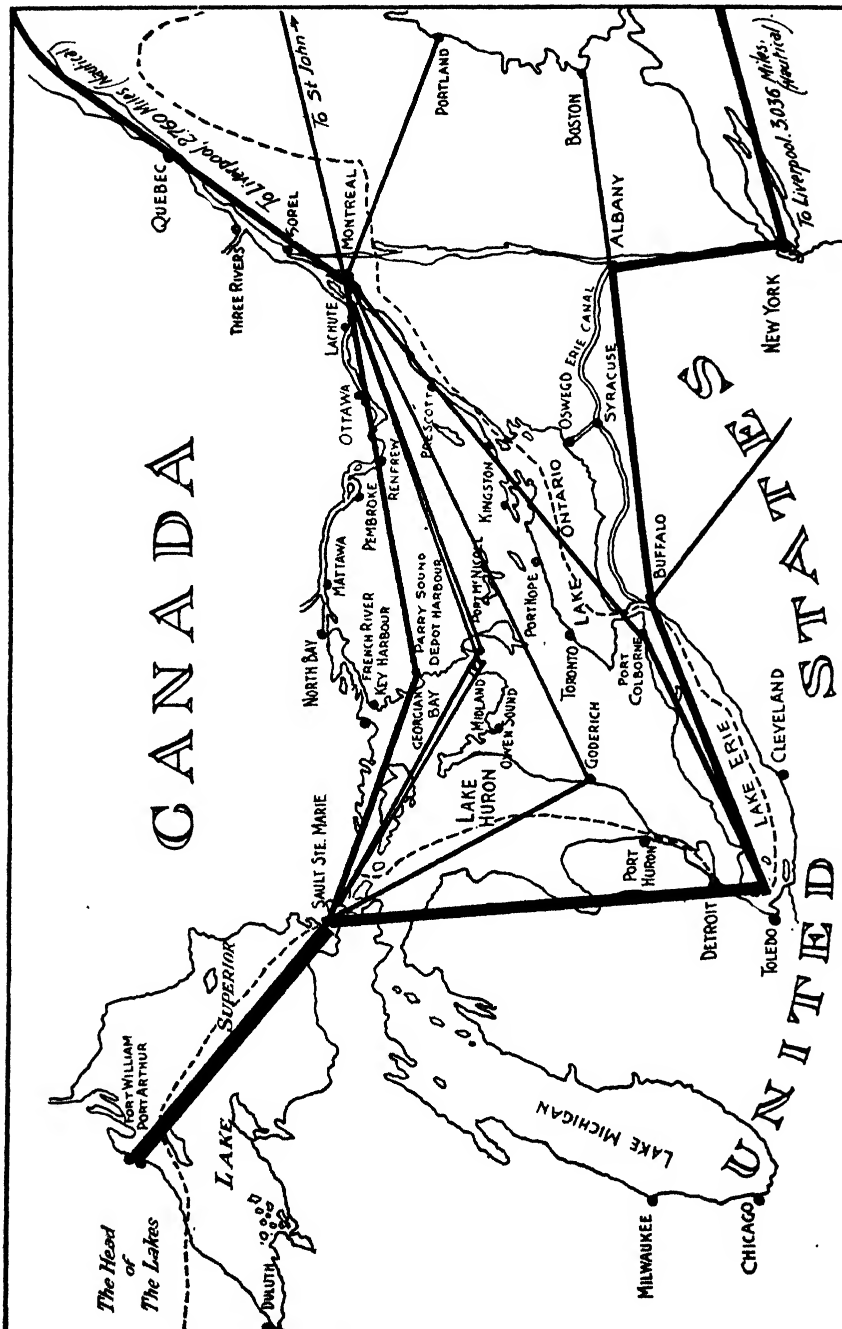
The Saskatchewan Co-operative Elevator Company, comprising 23,000 farmer shareholders, operates 354 country elevators, having a total capacity of ten and a half million bushels, and a terminal plant with a capacity of 7,750,000 bushels. This one company claims to have handled 43 million bushels of all grains in 1922-23.

The terminal elevators at the twin ports of Fort William and Port Arthur at the head of Lake Superior have a combined storage capacity of approximately 60,000,000 bushels, which is greater than either Chicago, Minneapolis or St Paul in the United States. The total receipts of wheat at these ports in the crop year 1922-23 was 244,915,000 bushels, and the shipments, lake, 229,819,000 bushels, rail, 18,424,000 bushels.

Channels of Export

From the terminal elevators at the head of Lake Superior the wheat is transported through the Great Lakes to various trans-shipping points. Wheat destined for shipment via the port of Montreal is conveyed either to the Georgian Bay and Lake Huron elevators, and thence by rail to Montreal, or else is transported all the way by water to that port, where it passes through the port elevators to ocean vessels. During the winter months, export wheat is conveyed by rail chiefly to the ocean port of St. John, New Brunswick, and to Portland in the State of Maine. From St John 12,000,000 bushels and from Quebec, 2,654,500 bushels were shipped in 1923.

* Statistics supplied by Natural Resources Intelligence Services, Department of the Interior



Grain Routes from the Head of the Lakes.

Wheat destined for export through the United States ports of Boston, New York, Philadelphia, and Baltimore is for the most part conveyed by vessel from the head of the lakes to the port of Buffalo, N.Y.

The vessels engaged in grain transportation on the Great Lakes are chiefly of American, Canadian and British registry. The lake vessels often have a carrying capacity of 300,000 bushels, which is equivalent to six or seven trains of 40 cars of 1,200 bushels. The vessels are loaded by gravity direct from the elevators situated on the water front at an average of 75,000 to 100,000 bushels per hour.

Statistical returns published by the Dominion Bureau of Statistics make evident the fact that a large proportion of the wheat and flour exported by this country passes through other than Canadian channels after leaving the head of the lakes. Of 174,000,000 bushels of wheat exported to the United Kingdom during the crop year ended August 31, 1923, 125,500,000 bushels were shipped via United States ports compared with 48,500,000 via Canadian ports. Of 4,697,745 barrels of flour destined for the United Kingdom, in 1923, 1,549,450 barrels left via the United States and 3,148,295 via Canadian ports.

Commenting upon this aspect of our export business, the report of the Harbour Commissioners of Montreal, 1922, p. 8, says:—

"It thus appears that though Canadian capitalists and taxpayers have provided, within the bounds of their own country, large storage and ample transit facilities at every stage in the movement of the crop to market . . . . yet the marketing and thus the forwarding of more than three-fifths of the grain is controlled by agencies which see to it that tribute and toll are paid to transit systems competing with our own."

That so small a percentage of Canadian export wheat reaches the Atlantic seaboard by the St. Lawrence route in spite of the recognized efficiency and superiority of Canadian transportation and harbour facilities is a matter affecting Canada's most vital interests.

Government Elevator System

Terminal and public elevators, owned by the Government of Canada, have been erected at various points throughout Canada from Halifax to Vancouver. They are eight in number and are under the control of the Board of Grain Commissioners; their location, capacity and operation being as follows:*

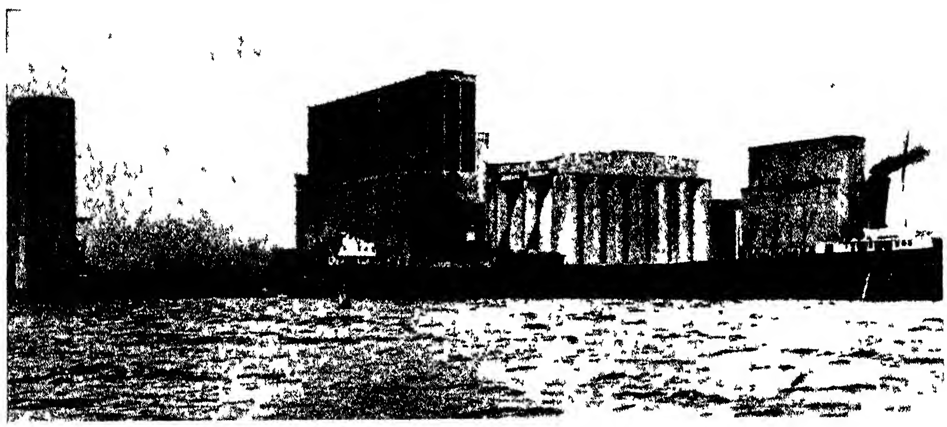
Location	Kind of Elevator	Operated by	Capacity
			bushels
Halifax, N.S.	Public	Can. Nat. Rys.	500,000
Tiffin, Ont.	"	"	2,250,000
Port Colborne, Ont.	"	Dept. Rys. and Canals	2,000,000
Port Arthur, Ont.	Public Terminal	Board of Grain Com	3,250,000
Saskatoon, Sask.	Interior Pub. Terminal	" "	3,500,000
Moose Jaw, Sask.	" "	" "	3,500,000
Calgary, Alta.	" "	" "	2,500,000
Vancouver, B.C.	Public terminal	Vancouver Harbour Com	1,250,000

The Secretary of the Board of Grain Commissioners supplies the following information:—

"The entry of the Government into the commercial handling of grain was due primarily to agitation on the part of the agricultural interests in

* Supplied by the Natural Resources Intelligence Service.

the West regarding the operation of privately-owned terminal elevators. A public terminal elevator was built by the Government at Port Arthur, Ontario, with the following objects in view: (1) to demonstrate whether the tariff of charges in effect at privately-owned terminal elevators was excessive or not; (2) to provide the farmers of Western Canada with an absolutely government-owned and controlled elevator to which they could consign their grain; (3) to assist, in a general way, the more rapid movement of grain.



Canadian Government Grain Elevator at Port Arthur Lake Superior

"With these objects still in view, further elevators were erected by the Government at Moose Jaw and Saskatoon in Saskatchewan, at Calgary in Alberta, and at Vancouver in British Columbia The erection and operation of the interior terminal elevators at Moose Jaw, Saskatoon and Calgary provided storage for eight and a half million bushels of grain, and largely takes care of the grain between the close and the opening of navigation

"All the elevators operated by the Board of Grain Commissioners are of the most modern and fireproof construction Up-to-date machinery is installed for the drying, cleaning, and handling of grain These elevators are also provided with inspection and weighing facilities to the same extent as the elevators at the lake terminals, official weight and grade certificates being issued and warehouse receipts issued and registered for all grain received.

"Officers having charge of the inspection and the supervision of weighing at the Canadian Government elevators are absolutely independent of the management of the elevator system The elevator superintendents have no more control over them than have the superintendents of any privately-owned elevators control over the Government inspectors and weighmen installed at their plants. The inspectors in each case are responsible to the chief inspector for the Dominion, and the weighmen are responsible to the chief weighmaster.

"The elevator at Vancouver, British Columbia, is really a transfer elevator, built with the object of establishing a connecting link between the Prairie Provinces and oriental markets, and in order to demonstrate the feasibility of shipping grain between Vancouver and Europe by the Panama route, it being intended that this elevator should operate for these purposes

in conjunction with the interior terminal elevators at Moose Jaw, Saskatoon and Calgary. Official weighing and inspection facilities are also provided in the Vancouver elevator.

"The objects served by the interior terminal elevators at Moose Jaw, Saskatoon and Calgary might be briefly enumerated as follows: (1) to provide facilities for meeting emergencies, which experience has shown frequently occur, affecting the grain trade of Western Canada. There have been from time to time congestions due to shortage in storage and shortage in railway cars, and there have also been seasons when, owing to the lack of drying and other hospital facilities in the grain field, there has been very serious loss incurred by the producers of grain. The interior terminal elevators were intended in the first instance to provide for such emergencies; (2) to provide a certain amount of surplus storage as near to the point of production as possible; (3) to provide a certain amount of cheap storage for local mills throughout the West, thereby stimulating the milling industries of the Prairie Provinces; (4) to provide means whereby the producers of grain in the West might have an opportunity of retaining some of the by-products of their grain in the West, thereby supplying one of the conditions necessary for the adequate development of mixed farming; (5) to give the agriculturists an opportunity of taking full advantage of all available markets, whether west, south or east, as the demand might arise; (6) to provide for the cleaning and preparing of seed grain, both for the West and for the East, special machinery being installed for this purpose.

"In addition to the handling of commercial grain, a considerable amount of specially selected seed wheat and seed oats has been handled at the interior elevators for the Dominion Department of Agriculture, the screenings from which, as in the case of commercial grain, are retained in the West, thereby rendering available to the live stock industries the necessary feeding commodities at a minimum of expense."

Port of Montreal

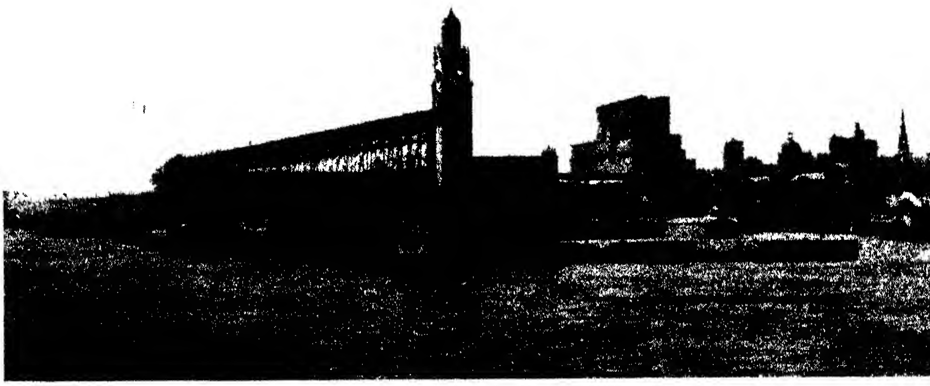
The port of Montreal is the interchange point between the Atlantic ocean and a system of lake and canal navigation extending inland sixteen hundred miles or almost to the eastern boundary of Manitoba, the central province of Canada. From the harbour of Montreal there is direct steamship service to practically every port in the world.

Montreal ranks first among seaports in the export of grain, shipping in 1921, in the seven months' season of navigation, 138,500,000 bushels compared with 84,700,000 bushels from the port of New York, its nearest rival, in twelve months. In the same period in 1922, Montreal delivered 154,721,505 bushels of wheat and other grains.

The present capacity of its grain elevators is eleven and a half million bushels, and an extension of 1,100,000 bushels is approaching completion. Construction is also well advanced on the first unit of a new elevator, having a capacity of 2,500,000 bushels, and work has begun on a second unit of like capacity. These new units are intended to be in operation at the opening of the 1924 season of navigation, when the total elevator capacity will be 17,600,000 bushels.

Practically from the opening of navigation until the departure of the last loaded grain vessel for sea, the elevators are in operation day and night,

unloading grain from lake vessels and from the cars of the three railway systems of the country and delivering it to the holds of the waiting ocean vessels as fast as they are ready to receive it.



The Port of Montreal View showing Victoria Pier with Sailors Memorial Tower and on of the great grain elevators Nearly twelve hundred ocean-going vessels arrived and cleared from this port during the 1922 season of navigation.

The exports of wheat for the crop year (August 31) 1923, from the port of Montreal to the United Kingdom were 28,343,589 bushels, and to other countries, 26,032,742 bushels In the same period the exports of wheat flour were 2,194,347 barrels to the United Kingdom and 1,511,353 barrels to other countries.

Port of Vancouver

A significant development of the last few years has been the diversion of a part of the Alberta and Western Saskatchewan crop to the Pacific coast, due to the expansion of trade with the Orient and Australasia, and the greater use of the Panama Canal route in shipping to Europe. The growing wheat exports through the Port of Vancouver give evidence of this. The year 1921 saw practically the beginning of this development when six million bushels of wheat were exported via Vancouver. In 1921-22, crop year, 7,837,171 bushels were exported and in 1922-23, 17,829,687 bushels, of which 10,506,635 went to the United Kingdom, and 7,323,052 to other countries. In the same year, 78,832 barrels of wheat flour were exported to the United Kingdom, 52,263 to the United States, and 694,696 barrels to other countries. To keep pace with growth, grain storage accommodation is being considerably augmented. The present government elevator at Vancouver—1,250,000 bushels—has been increased in capacity by 808,000 bushels, and a new ele-

vator to hold 2,000,000 bushels will be ready for use early in 1924. Other accommodation is being provided, which it is expected will bring the total up to 5,000,000 bushels in the near future.

Vancouver now has its own grain exchange to facilitate the business of buying and selling, and with greater storage and handling facilities provided, it is anticipated that an increasing percentage of the western crop will be shipped each year via this port.

Financing the Crop

The credit necessary to enable elevator companies and commission merchants to pay cash to the farmer for wheat on delivery is provided by the Canadian banks. The amount required for this purpose annually is in the neighbourhood of one hundred million dollars. By this system the farmer is not compelled to wait for a purchaser, but can dispose of his crop for cash as soon after it is threshed as he desires to do so. Having paid the farmer for his wheat at current quotations, the elevator company immediately resells through the Grain Exchange, and thus protects itself against a possible decline in values, besides keeping credit in circulation.

Buying and Selling

Wheat is purchased and sold through the medium of the Grain Exchange. The Exchange is an organization of brokers and dealers established at the principal centres to quote prices and to facilitate the business of buying and selling. The sellers are the elevator companies, the farmers' trading companies and the commission men, while the buyers comprise the millers and exporters. The bulk of the western crop is marketed through the Winnipeg Grain Exchange, which in 1915-16 achieved, and still holds, the distinction of being the largest cash wheat marketing organization existing anywhere.

THE EDITOR.

FORAGE CROP IMPROVEMENT

By G. P. McROSTIE, Ph. D. Dominion Agrostologist, Central Experimental Farm

THERE is a certain type of service which can be better performed by a community than by an individual. Such service is of the type where the cost of performing it is so great that an individual could not hope to receive sufficient benefit to recompense him for the money spent to obtain the desired result. The plant improvement work carried out by the various plant breeders of the country is obviously of the community type of service. The cost of obtaining an improved variety of any of our farm crops is usually much greater than the increased revenue derived by any individual grower from such an improved variety. However, if this initial cost is divided among the growers of a large area, the rate per grower is reduced to such a small amount that the increased revenue obtained from the improved variety in any season usually more than pays the total cost of producing such a variey.

The improvement of our various forage crops bears out the previously mentioned facts very forcibly, because most of our forage crops are open fertilized, and consequently being continually intercrossed they are much more of a mixture than is oats, wheat, or barley, which crops do not intercross to any appreciable extent. Plants which constantly intercross are more difficult, and hence more expensive to improve than are plants which do not intercross. With forage plants, therefore, the Experiment Stations, where the expense is borne by many people rather than on the individual farm, where the grower has to bear all expenses himself, is the logical place for the improvement of such crops to be carried out.

As previously intimated, the great majority of our forage crops are composed of a mixture of types, among these types will be found individuals which are low yielders and otherwise undesirable. Such individuals hold down both the general yield and quality of the crop which harbors them. There are also to be found in this same mixture individuals of high yielding capacity and of good quality. These latter tend to raise the general yield and quality of the crop in which they occur. The first problem in the improvement of forage plants is, therefore, the separation of the various mixtures into their component strains. This can most efficiently be done by repeated self fertilizations where such is possible. Reference to a particular crop will best illustrate the method of procedure: About 1911 a large number of lots of seed were collected from timothy plants found growing in different sections of Canada. All of this seed was brought to the Central Experimental Farm at Ottawa and planted out. The seed from each plant was planted in a separate row, the plants being spaced far enough apart in the row that they could be studied as individuals. As these plants approached the flowering stage, individuals of particular merit were marked in each lot. These marked individual plants were enclosed in a muslin cage that prevented any intercrossing with surrounding plants. Seed from the caged individuals was harvested and planted out the following year in the same manner as the parent plants had been planted previously.

Selection was continued with this second and with succeeding generations. The desirable plants were caged in all generations where selections were made and the progeny of each caged plant was kept separate

through succeeding generations; hence, a constant inbreeding was carried out.

The product of each successive self-fertilization became more nearly uniform until after five generations of inbreeding the original mixed selections were separated into true breeding strains.

In the course of this inbreeding process, many undesirable strains appeared and were discarded as soon as the repeated self-fertilizations had brought out their undesirable characteristics.

These purified strains of timothy are heavier yielding and more desirable than commercial mixtures. A composite, which has been given the name of Boon timothy, of the most desirable pure strains has been grown in comparison with ordinary commercial timothy mixtures and has always outyielded the commercial lots by at least fifteen per cent.

The same general principal of inbreeding is being followed at the Central Experimental Farm in the improvement of nine (9) other types of grasses, seven (7) legume types, and also with field roots of various kinds and with corn and sunflowers. Some of these crops, as corn and sunflowers, when inbred, decrease very materially in vigor for the first few generations of self fertilization. With such types it is necessary to recombine similar desirable types in order to re-establish the original vigor of growth. The inbreeding, however, enables us to eliminate undesirable strains so that when the desirable ones are recombined the resulting mixture produces a very profitable increase over an unpurified lot of a similar variety.

Desirable individual plants of timothy caged to prevent cross-pollination with surrounding plants

The possibility of separating the component strains from a mixed commercial sample is well illustrated by the strains resulting from three years' inbreeding with sunflowers at the Central Experimental Farm. The crop grown from commercial sunflower seed probably represents as many types as it is possible to find in any lot of seed of our ordinary farm crops. The mixture sold under the name of Mammoth Russian, Giant Russian, etc., is the most commonly grown for ensilage purposes and this so called variety is no exception in the matter of being composed of a great variety of types. It was this variety that was used to

the greatest extent in breeding improved strains at the station previously mentioned. Three generations of inbreeding has resulted in the separation of strains which are remarkably uniform in height, habit of branching, leafiness, maturity and other characteristics Another two or three generations of self fertilization will result in strains in which the various growth characters will breed true through succeeding generations.

alfalfa plants are simply caged and remain otherwise untouched. This is because insects, in visiting the plant in search of pollen or nectar, trip the flower This tripping process consists in releasing the pistil which is held under tension and causing it to strike the keel of the flower. The stamens are carried along with the pistil and the pollen is scattered around as a result of contact with the keel With the caged plants it is necessary in order to secure a satisfactory set of

Tripping Alfalfa flowers in one of the isolation cages used in the improvement of this crop

seed for some person to go inside the cage and perform this operation of tripping An ordinary toothpick is the instrument very often used for this purpose.

Alfalfa is another crop which is being improved quite rapidly by means of inbreeding to eliminate undesirable types A commercial lot of Grimm alfalfa has been the foundation material for the greater part of the breeding with the crop in question at the Central Farm. Alfalfa is intercrossed mostly by means of insects, hence to protect this plant from cross pollination it is necessary to prevent insect visits to it. This is done quite satisfactorily by means of large cages covered with a fine mesh wire cloth. Very little seed is set if

After the various forage crops have been separated into their component strains or purified varieties it is sometimes found that there is still much to be done in the way or originating a variety that will be entirely satisfactory for a locality with special requirements It then becomes necessary to build up the desired type of plant by means of hybridization.

This is frequently done in the improvement of our forage crops, although as yet the major portion of improvement work consists in the separation of our various commercial mixtures into pure strains.

The intensive research that has been carried on during the past few years concerning the morphology of plants and how their various characters are passed on from one generation to the next has opened up wonderful possibilities to the plant improver. Never in the history of plant breeding has there been a period when there was so much constructive, profitable breeding under way as at the present time, and it would seem as if the people at large could expect to receive even more value for every dollar invested in such work than they have ever received before.

AGRICULTURAL INSTRUCTION GRANT, 1923-24

WITH the conclusion of the Dominion Fiscal Year on March 31, 1923, *The Agricultural Instruction Act* passed out of existence. This Act provided for division among the Provinces of Canada of the sum of $10,000,000, during the ten-year period in which it was in operation, the object being to promote agricultural education and instruction. Under the terms of the Act, a stipulated sum was allocated to each of the provinces annually, and the balance divided pro-rata, according to population. The Act was not renewed, but for this year 1923-24, Parliament voted the sum of $900,000 to the Provinces of Canada for the purpose of assisting and encouraging agricultural instruction. The basis of distribution is the same as previously, that is to say, each province receives the sum of twenty thousand dollars, the balance being divided according to population as determined by the census, the figures being those of the census of 1921 instead of 1911. The amount granted is $200,000 less than the sum allocated in the year previous. Changes in the figures as to population have somewhat altered the proportional distribution. A comparison of the allocation of 1922-23 and 1923-24 is as follows:

Province	1922-23	1923-24
	$ cts	$ cts
Ontario	336,303 26	254 001 57
Quebec	271 113 76	208,339 45
Manitoba	77 113 11	68,665 65
Saskatchewan	81 728 48	80,422 27
Alberta	66 965 62	66,937 64
British Columbia	69 199 06	61,842 92
Nova Scotia	81 716 69	61,783 51
New Brunswick	64 110 80	50,938 67
Prince Edward Island	31 749 22	27,068 32
Veterinary Colleges	20 000 00	20,000 00
Totals	1 100 000 00	900,000,00

The terms of the agreement between the Dominion and the Provinces are the same as under the Agricultural Instruction Act. The specific purposes for which the grant of 1923-24 is allotted and the amounts set forth in the Memorandum of Agreement are respectively as follows:

PROVINCE OF ONTARIO

		$ cts	$ cts.
Ontario Agricultural College—			
Salaries and expenses.		9,000 00	
Agricultural School and Farm—			
(a) Capital expenditure ...	$ 3,000		
(b) Administrative and teaching staff, and maintenance and equipment .	49,000		
		52,000 00	

Instruction and Demonstration—		
Agricultural representatives	136,000 00	
Extension work in household science	1,500 00	
Demonstrations in vegetable growing	4,000 00	
Co-operation and markets	6,000 00	
Short courses for winners of field crop and live stock competitions including travelling and living expenses	1,000 00	
Lectures on horticulture	750 00	
Demonstration work on soils	9,500 00	
Beekeeping		
Drainage work	4,751 57	
Fall Fair and Field Crop Judges	2,000 00	
Demonstrations in live stock and poultry	3,500 00	
Elementary Agricultural Education—		
To provide for and encourage the teaching of agriculture in High and Public Schools	24,000 00	
		254,001 57

PROVINCE OF QUEBEC

School of Agriculture	75,000 00	
Animal Husbandry	8,000 00	
Poultry	15,000 00	
Horticulture	25,000 00	
Dairying industry		
Agricultural representatives	60,339 45	
Seed selection		
Bee-keeping, educational work	5,000 00	
To promote teaching of agriculture in Academies, Rural and Normal schools, teacher training, school gardens and school children's exhibits	10,000 00	
To promote teaching of domestic science in Academies and Normal schools,—grants, lectures and inspection	10,000 00	
Total		208,339 45

PROVINCE OF MANITOBA

1. Field crops and Live Stock promotion	9,000 00	
2. Dairy work	8,000 00	
3. Poultry work	3,000 00	
4. Boys' and Girls' Clubs	20,000 00	
5. Home economics	8,000 00	
6. Short courses	8,000 00	
7. Soil analysis and survey	1,000 00	
8. Beekeeping	4,000 00	
9. Demonstration Farms	6,000 00	
10. Miscellaneous and Contingency	1,665 65	
Total		68,665 65

PROVINCE OF SASKATCHEWAN

Staff salaries, research and Extension Service	11,300 00	
Women's work, Homemakers' Clubs	14,974 09	
Agricultural representatives	25,774 09	
Veterinary Short Courses	500 00	
Agricultural Instruction in Public, High, and Normal Schools, Household Science, Training of Teachers, Nature Study	11,674 09	
Grants to Schools operating Departments in Household Science	4,500 00	
Expenses of officials of School Fairs	10,100 00	
Post Graduate Course in Agriculture (Agricultural Scholarships)	1,600 00	
Total		80,422 27

PROVINCE OF ALBERTA

Schools of Agriculture	20,000 00	
School Fairs	20,000 00	
Women's work	10,000 00	
Poultry extension work		
Educational work in agriculture	10,000 00	
Agricultural Representatives	6,937 64	
Total		66,937 64

PROVINCE OF BRITISH COLUMBIA

Seed work	438 00	
Silo Demonstration		
Horticultural Demonstration and Competitions	877 00	
Poultry	1,534 32	
Dairy and Cow-testing	7,897 00	
Bee-keeping	4,387 00	
Boys' and Girls' Clubs	1,096 00	
Agricultural Journal and Publications Branch	4,385 00	
Agricultural Instruction in Schools	20,614 30	
University of British Columbia	20,614 30	
Total		61,842 92

PROVINCE OF NOVA SCOTIA

College of Agriculture—		
Science Building interest and sinking fund	7,000 00	
Salaries and maintenance	23,000 00	
Agricultural representatives	5,000 00	
Short Courses	1,350 00	
Dairying	4,200 00	
Poultry	200 00	
Soils, crops, fertilizers, drainage	1,700 00	
Fruit growing	600 00	
Women's work	5,000 00	
Entomological work	5,500 00	
Elementary agricultural education	8,000 00	
Contingencies	233 51	
Total		61,783 51

PROVINCE OF NEW BRUNSWICK

	$ cts.	$ cts.
Agricultural Schools	252 57	
District Representatives	5,266 27	
Bee-keeping	1,359 55	
Soils and Drainage	944 52	
Horticulture	4,177 84	
Short Courses	2,037 45	
Live Stock	2,297 57	
Dairying	3,880 01	
Poultry	2,610 22	
Entomology	488 30	
Agricultural Societies	2,197 77	
Women's Institutes	4,670 11	
Elementary Agricultural Education	10,756 49	
Agricultural School, Experimental Farm (First Payment)	10,000 00	
Total		50,938 67

PROVINCE OF PRINCE EDWARD ISLAND

	$ cts.	$ cts.
Agricultural buildings, equipment and maintenance	1,200 00	
Director and Agricultural Representatives	4,550 00	
Short Courses	700 00	
Drainage, soils and crops	2,500 00	
Live Stock and Dairying	2,600 00	
Poultry, horticulture, beekeeping and co-operative marketing	600 00	
Women's Institutes	3,330 00	
Elementary agricultural education, Agricultural Instruction in Public and High Schools, training of teachers, allowances, grants, maintenance of rural science department, Prince of Wales College	8,600 00	
Contingencies and miscellaneous	2,988 32	
al		27,068 32

EXPERIMENTAL BEEF SHIPMENTS

SINCE the removal of the cattle embargo last spring, there has been a considerable amount of discussion as to the best methods of marketing Canadian beef animals in Great Britain, and, in order to obtain reliable data from carefully conducted and recorded experiments, the Department of Agriculture shipped a number of steers from the Experimental Farms to England last June, and the figures obtained from this experiment are now available.

The experiment consisted of making careful comparisons of the costs and returns from 186 steers collected from the Experimental Farms and Stations at Lethbridge, Alta., Indian Head, Sask., Rosthern, Sask., Brandon, Man., Ottawa, Ont., Lennoxville, Que., and Kentville, N.S. These steers were divided into five lots at Montreal, and disposed of as follows:—

Six rough steers, which were considered unsuitable for overseas shipment, were killed at Montreal and sold there as fresh beef. These averaged 1,095 pounds in weight and realized $6.30 per cwt. live weight at Montreal, or $5.65 per cwt. when shipping charges to Montreal were deducted.

Fifty fat steers, averaging 1,252 pounds each, were slaughtered in Montreal. The carcases, after being very carefully prepared, were chilled and shipped to the London market for sale as chilled beef. This beef sold in London for approximately 12½ cents per pound wholesale for hind quarters, and 6 cents per pound for fore quarters. It should be noted, however, that several factors operated against a favourable sale in this case. Large shipments of chilled beef from the Argentine had forced meat prices down generally, while the Canadian beef was not dressed in exactly the right manner to command the very highest British price. Furthermore, the necessity of shipping the meat by rail from Liverpool to London did not improve its condition.

The returns from this chilled beef, allowing for all killing, shipping, and selling, as well as revenue from offals at Montreal, showed a value of $3.93 per cwt. live weight at Montreal, and a net return of $2.96 per cwt. if shipping charges to Montreal are deducted.

Twenty-five fat steers, average weight 1,209 pounds, were shipped to Birkenhead and slaughtered immediately on arrival. These realized an average price equivalent to a value of $7.53 per cwt. live weight at Montreal, or a net return of $6.73 per cwt. after deducting shipping charges to Montreal.

Twenty-five fat steers, average weight 1,296 pounds, were sold in England as short keep stores, and realized a price equivalent to a value of $9.33 per cwt., live weight at Montreal, or $8.58 per cwt. at point of origin.

Seventy-five store cattle, average weight 1,142 pounds, sold in England as stores, realized a price equivalent to a value of $8.03 per cwt. live weight at Montreal, or a net value of $7.18 per cwt. at point of origin.

Five rough stores, averaging 1,142 pounds, were slaughtered at Birkenhead and sold there as fresh beef. These gave a return equal to a value of $7.93 per cwt. live weight at Montreal, or a net value of $7.08 per cwt. It should be pointed out, however, that this lot, being sold at Birkenhead, did not have charged against them the railway transportation from Liverpool to London, which had to be charged against the twenty-five other steers killed at Birkenhead and sold in London, mentioned in a previous paragraph.

The returns from slaughter-house by-products from steers killed at Montreal and Birkenhead furnished an interesting and illuminating comparison. While the hides, offal, etc., from the steers killed at Montreal realied only 80 cents per cwt. of live weight or $9.88 per steer, similar returns from steers slaughtered at Birkenhead showed $1.46 per cwt., or $17.49 per steer. In other words, cattle shipped to England and killed under conditions obtaining at that time realized 76 cents per cwt. more than cattle killed in Canada due to the difference in value of slaughter-house by-products alone.

The average cost of landing store cattle in England from the various Experimental Farms was found to be $42.37 per head or $3.58 per cwt. live weight, based on Montreal weights, these costs varying between $34.71 per head for the Ottawa shipment, nearest Montreal, and $50.79 per head for the Lethbridge shipment, the point farthest away.

To summarize the experiment, it may be said that, even taking into account the exceptionally unfavourable market and other adverse conditions experienced in this case for chilled beef, it is more profitable to ship fat cattle for immediate slaughter at Birkenhead than to kill in Canada and ship the meat chilled, while the most profitable method of all is to ship such cattle as meet the requirements for sale as short keep or long keep stores, although well-finished cattle, uniform as to size, weight and finish will meet a good demand if shipped for immediate slaughter.

Smooth polled, well-bred steers, sorted according to size, colour and finish, weighing from 1,000 to 1,250 pounds live weight, best meet the requirements for stores. Cattle "level in lots" sell to best advantage either by public auction or private treaty, and a thin, well-bred animal will frequently sell to better advantage than a rough, heavier steer.

The placing of a reliable foreman in charge of the shipment on the ocean voyage, to see that the animals are given proper attention, will result in better returns due to the better condition of the animals on arrival.

A pamphlet, prepared by the Division of Animal Husbandry of the Experimental Farms Branch, giving full details of this experiment, together with detailed costs and returns, is available for distribution to interested applicants.

COW TESTING

Some Herd Increases, 1920-1922

AT the Agricultural School at Oka, P.Q., the Trappist Fathers have built up a very high producing herd of Ayrshire and Canadian cows. The increase in the average production has been exceedingly rapid in the last three years, until in 1922 it reached nearly 9,000 pounds of milk per cow.

The following figures show the average production for the last three years and are for all cows recorded for eight months or longer:—

Year	No. Cows	Average Production		
		Milk	Test	Fat
		lbs.	per cent	lbs.
1920	44	6,733	3·83	257·7
1921	43	8,806	3·79	334·2
1922	46	8,901	3·88	346·0
Average increase per cow		2,168		88·3

In 1920, there were eleven cows in the herd which produced 300 pounds

fat or over; while in 1922, 30 cows, or over 66 per cent of the total cows in the herd, produced over 300 pounds fat. The average for the 10 best cows in 1922 was 10,811 pounds milk and 409 pounds fat.

At Blenheim in Kent County, Ont., C. E. Rowe has also shown that persistent and intelligent use of dairy records will help to increase milk production. The following table shows the results obtained during the past three seasons:—

Year	No. Cows	Average Production		
		Milk	Test	Fat
		lbs	per cent	lbs
1920	10	7,488	3.29	246·5
1921	11	8,464	3.39	287.5
1922	11	10,235	3.38	346.4
Average increase per cow		2,747		99.9

In the case of the herd of Mr. Rowe this increase in production amounted to nearly 1,100 pounds butterfat for the year, which, at 35c. per pound butterfat, would be worth $385. This increase in income would be very nearly all extra profit as the size of the herd was not increased.

Increased production per cow is a possibility in every herd in Canada if the owners will take stock of each individual cow's production and then eliminate the poor producers.

New York State Results

The last monthly report of the New York State cow testing associations gives some interesting figures on the progress made in milk and fat production. In 1921, the average production of all cows in eleven associations was 6,403.3 pounds milk and 235.29 pounds fat. In 1923, all yearly records for sixteen associations show an average production for 2,480 cows of 7,257.3 pounds milk and 261.3 pounds fat. This is an increase of over thirteen per cent in milk production and eleven per cent in fat production in one year. The average milk production for New York State is given as 4,267 pounds milk. The advantage of belonging to a cow testing association is very evident from these figures.

If the average production of Canadian cows were equal to that of the New York cow testing association cows, Canada could produce the same quantity of milk with very few more than half the present number of cows, and the amount of labour, feed, time and money saved would make an inconceivable total.

IMPORTATION OF NURSERY STOCK

On September 1, 1923, new regulations under The Destructive Insect and Pest Act went into effect. Importers of nursery stock, which includes all plants for ornamental purposes or propagation, but not seeds or seed potatoes, are hereafter required to secure a permit from the Secretary of the Destructive Insect and Pest Act Advisory Board, Department of Agriculture, Ottawa. The permit must be filed with the Collector of Customs at the port of entry.

All importations of nursery stock must be accompanied by a certificate of inspection issued by an authorized official in the country of origin stating that the stock is apparently free from any disease or pest within the meaning of the Act.

Nursery stock originating in any foreign country other than the United States of America, shall be imported only through the following ports, and may not be transmitted through the mails: St. John, N.B.; Montreal, Que.; Ottawa, Ont. (for scientific purposes

only); Niagara Falls, Ont.; Vancouver, B.C.

At these ports shipments shall be reinspected, or they may be allowed to proceed to their destination for inspection. All shipments from the United States consigned to residents of the province of British Columbia must be forwarded to Vancouver for reinspection.

The importation of a number of plants and fruits is prohibited from certain countries and from certain of the United States of America, on account of insect pests and plant diseases.

THE SEEDS ACT, 1923

THE Seeds Act, 1923, with regulations thereunder, effective from October 1, 1923, will replace the Seed Control Act, 1911, which had compulsory grades for timothy, red clover, alsike and alfalfa seeds, and voluntary grades for seed grain and other seeds.

The new Act requires that all grass, clover and other field seeds, excepting root and vegetable seed, must be graded when sold for seeding. Farmers, however, are exempt from grading cereal grains, buckwheat, field peas and beans, and corn when sold on their own premises for seeding by the purchaser himself.

Dominion seed laboratories for the testing and grading of seeds are available at Calgary for Alberta and British Columbia, Winnipeg for Manitoba and Saskatchewan, Toronto for Western Ontario, Quebec for that province, and Ottawa for Eastern Ontario and the Maritime Provinces. A farmer or seedsman may have ten samples tested free of charge if received during January and after May 1. Testing samples for the control of the seed trade occupies the full time of the laboratory staffs during February, March and April.

Copies of the Seeds Act, 1923, may be had on application to the Publications Branch, Department of Agriculture, Ottawa.

FRUIT DRYING PROJECT

THE plant at Grimsby, Ontario, for the dehydrating of fruits, lately established by the Dominion Department of Agriculture, began operations on a commercial scale this fall, after conducting preliminary experiments with satisfactory results. Chiefly peaches, plums and apples are being dealt with. This undertaking, which is the first of its kind in the Niagara District, is likely, it is believed, to lead to important developments in the direction of supplying consumers with native products in place of those now being imported.

The dehydration plant established this season in the Okanagan Valley, B.C., was destroyed by fire shortly after beginning operations, and further experiments will have to be deferred.

At the Central Experimental Farm, Ottawa, dehydration experiments have also been in progress during recent months with sour cherries, strawberries and other small fruits, the work being performed under the supervision of Mr. J. H. Robinson, chemist.

PART II

Provincial Departments of Agriculture

SOME PATHOLOGICAL PHASES OF BOVINE REPRODUCTION

By ALFRED SAVAGE, Animal Pathologist, Manitoba Agricultural College

SUCCESSFUL and continued reproduction is the foundation upon which all the animal industries are built. The process is of vital importance not only to stockmen, farmers and the meat consuming public, but also to dairymen, packers and the manufacturers who produce that immense diversity of animal products which civilized man uses in the course of his every day life.

Abnormalities of reproduction are most noticeable and cause the greatest losses under two conditions:

1. Where the reproductive process is most intense, and
2. Where the capital invested is largest.

For these reasons, and because the animals require almost incessant attention, they have been studied most in the case of dairy cattle, the products of which, calves and milk, are purely sexual. Some intensely interesting and profitable work has been done on the pathology of reproduction in horses, sheep, swine and dogs, but space forbids even the attempted discusssion of so large a subject where more than one species of animal is concerned.

Before one can speak intelligently on the losses due to abnormal reproduction, it is necessary to have a standard by which they can be measured. Happily this has already been fixed, and I can do no better than quote Williams[1], its originator.

"Breeders are not in perfect accord regarding the age at which it is best that a heifer should calve. In my writings[2] I have adopted two years as the ideal age, which necessitates conception at fifteen months. I have designated as "breeding months" each calender month after the fifteenth. The idea is assumed that after the fifteeenth month in the life of the animal, she shall produce one calf each twelve months, and that in order to do this, she shall be pregnant nine, and non-pregnant three in each twelve months (more accurately she should be pregnant 9.3 months and non-pregnant 2.7 months or 282 days and 83 days respectively). If the age of the animal is determined in months and the fifteen months prior to breeding age deducted, the remainder gives the total breeding months for the heifer or cow. If the total breeding months of the animal's life be divided by the number of calves born, the result will represent the average number of months required to produce a calf. In this scheme abortions are omitted and one may, if desired, omit or class separately, premature or diseased calves. If the ideal number of twelve months for the production of a calf be divided by the actual number required, the result will represent the reproductive efficiency attained by the animal. If, for example, an animal produces upon the average one calf each fifteen months, then the equation would be $\frac{12}{15} \times 100$, or 80 per cent efficiency. The efficiency of the entire herd is readily obtained by determining the

sum total of the breeding months of all cows and heifers in the herd and dividing this by the total number of calves born, the result being the average number of months which the cows and heifers have been kept in the herd in order to produce a calf. In this calculation all heifers over fifteen months old are to be included. In calculating the efficiency of a cow up to a given date, it is essential to take into consideration her breeding condition at the time. If pregnant six months, the duration of pregnancy should be regarded as equal to two-thirds of a calf less any deduction suggested by the prevailing rate of abortion in the herd."

For the benefit of those who have not gone into the subject of breeding efficiency seriously and, in consequence, have rather nebulous ideas concerning the usual reproductive performance of herds it should, perhaps, be stated that the highest figure found by Williams[3] was 75 per cent of the ideal. This writer also states that in all the data assembled by him on this subject, the average efficiency has fallen below 60 per cent; in some herds it was below 30 per cent.

In order of their importance, the main reasons why breeding efficiency of individuals and herds falls so short of the ideal, when considered over a period of years, are as follows:

1. Sterility;
2. Diseases of the New Born;
3. Abortion.

This statement may easily be checked by observation. It is supported, at least insofar as the relative position of the first item appears, by Albrechtsen[4], Miller and Simms[5], Groome and McCoy[6], and other writers of practical experience.

The trinity of reproductive failures just enumerated has nullified some of the finest pedigrees ever reared by man: it has ruined many a breeder and doubtless spoiled more than one genetic experiment. And the worst of it is that while these disorders occur wherever there are cattle, the conditions best favouring their continuity are too often found in high-grade herds of pure-bred stock. Viewed from this angle, Thomas Bates' historical Duchess strain of Shorthorns furnishes some interesting material for reflection.

Abortion

The premature birth of a dead calf, say at about mid term, accompanied by the expulsion of a few gallons of pus and followed by retention of the fœtal envelopes is a sufficiently alarming event to attract attention anywhere. It is the most obvious reproductive failure. For this reason abortion was the first topic of the kind to receive serious study.

Nocard's Work.—In 1885 Nocard[7] attacked the subject. He examined fourteen aborts, noting that the intestinal canals contained a number of microbes and that the cadavers showed a marked tendency to putrify. He observed the altered condition of the fœtal membranes, the presence of pus in the uterus and commented on the accompanying metritis. This last he did not consider primarily responsible because, in sections made through the uterine walls, he observed only an epithelial desquamation.

From the exudate in the utero-chorionic space he obtained cultures of two organisms, one a micrococcus, the other a rod. Apparently the same coccus was obtained from the amniotic fluid of other cases, and in one instance, from the medulla of a fœtus. He considered this and the main agent responsible but, so far as I can ascertain, did not recommend any definite prophylactic or curative measures based on that assumption. His work was not further pursued and does not seem to have attracted very much attention at the time of its publication.

Bang and the Abortion bacillus.—Bank and Stribolt[8] in 1895, slaughtered a cow showing " the well known premonitory symptoms of abortion " and examined the entire pregnant uterus. They noted abnormalities in this organ and edema of the fœtal membranes. From the exudate in the utero-chorionic space they isolated, in pure culture, a decidedly peculiar organism now known as they originally designated it, *Bacillus abortus*.

These investigators subsequently infected, *per vaginam*, two pregnant cows obtained from sources where abortion was allegedly unknown. One of the animals aborted; the other was killed. From the uteri of both the same bacillus was recovered, but in one case, other organisms were also present. The conclusion drawn from these two cases cannot be passed over lightly: *" By both these experiments we have furnished the complete proof that the bacillus discovered by us is the cause of epizootic abortion."*

Some very pointed criticism may be levelled at this statement. For example, such unqualified use of the definite article *the* is unjustifiable, and as only cows were under consideration the word *epizootic* is not warranted. Further, we are told nothing about the bull nor about the state of the cows' genitals, so it is questionable whether the animals would not have aborted in the usual course of events. This is set forth in detail because Bang's statement, as given above, has dominated the struggling science of veterinary gynaecology for a full quarter century.

Bang further stated that the " disease " is followed by a certain amount of immunity and, among other measures, suggested its control by the use of biological agents.

The Growth of " Orthodoxy." For the time being, Nocard's work went to the wall. That of Bang lay practically unnoticed for about ten years and then there was a revival. The Bang organism was isolated in England in 1909[9], in America the following year[9], and very subsequently in most of the civilized countries of the world. Inasmuch as it has never been found associated with other than infected animals, and in view of Bang's conclusion, this bacillus worked itself into a position of monopoly. It became accepted and recognized as *the* cause of bovine (if not epizootic) abortion, and as such has occupied a unique place in the whole realm of bacteriology. It would be an impossibly large task to review all the literature bearing on the facts and theories of this dogma, but the main points can be set forth as follows:

Facts. The abortion bacillus is widespread, undoubtedly pathogenic for some species of animals, and is very commonly associated with bovine abortion. It has been found in the uteri of pregnant cattle, where it usually accompanies a suppurative metritis It may occur in various parts of the fœtus and its coverings, as well as in the fœtal bloodstream. Usually, after parturition or abortion, it disappears from the maternal uterus in from two to six weeks. For this reason it is maintained by many that it induces the specific metritis of abortion and few, if any, other lesions. Its presence in the pregnant uterus does not always induce abortion.

It has also been recovered from the mammary gland where, peculiarly enough, it seems to have the faculty of remaining for months without producing any visible lesions. The same statement holds true for the adjacent lymph nodes. Fairly recently it has been recovered from

the seminal vesicles of bulls[10] and in one instance at least[10] from a testicular abscess.

Owing to the specific blood reactions induced by infection with this bacillus, its presence in an animal may be diagnosed by the agglutination and complement fixation tests[11, 12].

While the above are pretty well established facts, there are several unproved but widely accepted statements that form part of the orthodox creed. The first of these is that if a healthy pregnant cow eats infected material, she will probably abort as a result[13, 14, 15]. The second, based on Bang's assertion, is that animals may become immune to the "disease," either naturally or artificially[8, 15]. Another seems to place the male animal on a plane apart from the rest of his species for it credits him not only with a "sex immunity" but a minor role in the spread of the "disease"[15]. And there are other beliefs of less importance.

Some Objections to "Orthodoxy."—Now this whole collection of opinions, theories and statements to which I believe he first applied the expression "orthodox," has been almost ceaselessly attacked by Williams[16] for the past ten years. As will be indicated presently, the activities of this investigator have been eminently sound and constructive, so sound in fact that he could not admit much of orthodoxy because it remained unproven. With him observation comes first, reflection second, and speculation hardly at all. And the accepted orthodox creed does not always fit in with the whole truth.

To begin with, there is the fundamental question, "How much etiological relationship does the Bang organism bear to abortion in cattle?" In answer to this, Williams[17] summarises and tabulates all the available records of experimental attempts to produce abortion, during an existing pregnancy, with the *B. abortus*, comparing them with direct and indirect controls. In conclusion, while not denying that the organism may be harmful and may even be a cause of abortion, he states "*It has not been clearly shown that a like number and kind of pregnant cattle would not have aborted had sterile salt solution been substituted for the Bang organism.*" The figures given certainly both permit and support that statement.

Next, there is a consideration of the control measures based on the assumption that Bang's organism is the specific cause of "contagious abortion." Williams has criticised these in at least two ways, which it is convenient to call positive and negative. His positive criticism begins by denying the existence of immunity to the act of abortion. Any female capable of becoming pregnant is potentially capable of aborting. That is obvious. Then he denies the probability of an immunity against infection with the *B. abortus* on the ground that such infection is by nature essentially chronic, and that successful immunity against bacterial invasions of this class is unknown. In this contention he is supported by Ascoli[18] who, working with laboratory animals, has shown that the alleged immunity to Bang's bacillus is merely increased toleration of its harmful effects.

A second criticism concerns attempts to produce immunity by the use of sera, bacterins, cultures, etc. A study of published results following the injection of biological agents shows clearly that both dead cultures of *B. abortus* and 'immune serum' are almost universally condemned as valueless for the prevention of abortion. The use of living cultures, however, is still being widely advocated by many. A peculiarly mis-

leading feature in this connection is that, following the injection of live organisms, the actual abortion rate is often lower in the test animals than in the control group. At first this seems to vindicate the whole orthodox scheme of things. Such is not the case, however, because, as Williams[19] has pointed out, the decline in actual abortions is nearly equalled by an increase in the occurrence of sterility, so that the resultant breeding efficiency is very little improved. Indeed, the procedure is, to say the least, highly questionable. It furnishes another example of "Out of the frying pan, into the fire."

By way of comment one is tempted to add that the effectiveness of successful vaccines has been recognized without delay, that is if those in use for the prevention of anthrax, blackleg and rabies may be considered examples. The 'vaccinationists' have been working at 'contagious abortion' for decades. Thus far they have not produced a convincing or well recognized result.

As negative criticism Williams states—"It has not been determined what, if any, effect upon the reproductive efficiency of a herd the elimination of *Bacterium abortus* infection would cause." This brief sentence represents the economic essence of three instalments by M'Fadyean[20].

Heresy.—Now for some heresy, and the term is used in the sense that it denotes fundamental differences.

Albrechtsen[21], a Scandinavian practitioner, noted that in many of the herds under his supervision it was impossible to obtain the specific blood reactions that indicated the presence of *B. abortus;* nevertheless breeding irregularities, including abortion, were rife.

The Spirillum of McFadyean, Stockman, Smith, et al.—In 1919, Stockman[22] called attention to a *vibrio* which he and McFadyean had isolated in connection with abortion in ewes more than six years previously, and which had been associated with at least three outbreaks of bovine abortion in Great Britain.

Theobald Smith[23] subsequently isolated what is now recognized as the same organism in America in 1918. Of 41 abortions in a certain group of herds, he identified 14 with this spirillum and 27 with the *B. abortus.* He also noted the presence, in some instances of colonoid bacteria.

Two years later, in collaboration with Little and Taylor[24], he published an account of 26 abortions in one herd, all, with one exception, seemingly due to this spirillum. The exception was associated with *B. abortus* in addition. As a check on cultural methods used in this work, agglutination tests were made on both blood and milk. All the animals were in their second or later pregnancies.

Axel Thomsen[25] also reports the recovery of this vibrio in four out of eleven cases of abortion.

The Paratyphoid Organism of Moussu Moussu[26], in 1914, reported the extensive occurrence of bovine abortion in France due to an organism of the colon-typhoid group, the *B. abortus* being absent.

Other Microbial Causes.—Tuberculosis of the pregnant uterus has been given as a cause of abortion by Bang, Axel Thomsen[25] and Williams; and it is interesting to note in passing that not only has Carpenter [27] catalogued a variety of bacteria isolated from a study of more than 50 aborts, but also that Theobald Smith has described an invasion of the fœtal membranes by a mould of the genus Mucor.

Williams and Modernism.—These discoveries do not fit in with the orthodox scheme of things at all, but in view of their existence, one seems

almost compelled to admit the worst 'heresy' of all, namely that of Williams[28]. Having defined the position of the "true believer" in this matter he states:—

> "The second group, to which the writer belongs, holds that abortion is not a specific contagious or infectious disease like glanders or hog cholera. On the contrary, it is held that any infection resident in the cervical end of the uterus, or which may, during pregnancy, invade the uterus, may, amongst other results, cause abortion. According to this view, there are two essential factors in the causation of abortion: the infection must destroy the life of the fœtus and must arouse such irritation of the uterus as to cause it to contract and expel its contents. Any infection capable of bringing about these two conditions may cause abortion, be it the streptoccus of Nocard, the colon organism of Moussu, the vibrio of McFadyean and Stockman, or the spirillum of Theobald Smith."

It is a long way from the view of Bang to that of Williams. It is a way which, once taken, permits of no return journey. Because it is in perfect accord with all the present facts of the subject and permits the future discovery of an unlimited number of "abortion organisms," I have called this attitude *modernism.*

Sterility

To avoid misunderstanding, it should be stated clearly that sterility is not a disease. It is simply failure, after mating, to produce a visible (or observed) fœtus. Strictly speaking, one should distinguish perhaps between failure to achieve fertilization and early death of the fertilized ovum. Practically, this is not often possible. Many early abortions occur unseen or unrecognized. They constitute sterility as one ordinarily meets it; so, largely for this reason, the heading occupies first place in the list of reproductive failures.

Sterility may be due to many causes, the commonest of which is infection. This infection is not specific and may invade both males and females. Giltner and Bandeen[31] have shown that, normally, "there is a general relationship between the flora of the generative mucosa of the two sexes". Udall Cushing and Fincher[32] reviewing 48 cases of sterility in cows that came under their care, state: "This group gives no support to the frequently expressed opinion that 'Bang's disease' is the chief primary cause of diseases included under the term sterility—that *B. abortus* introduces other infection and then shortly retires."

But infection, to be capable of resulting in sterility, must produce lesions. It does, and these are subject to variation according to the sex of the animal and the part involved. It would be profitless at present to do more than touch upon the commoner of these They, however, are of great importance

By far the most outstanding genital lesion interfering with reproduction in cows and heifers is a chronic inflammation of the uterine neck or cervix. It underlies abortion. Alone or associated with other lesions it is responsible for most cases of sterility. One practitioner--Lothe[33]—stated that this condition was responsible for 70 per cent of 500 sterile females treated by him.

In cervicitis the anatomical features of the part predispose chronicity. The passage is long and tortuous; the mucosa thrown into well developed circular folds. As a result the part becomes first inflamed, then deformed and finally indurated. These fairly definite stages follow one another slowly and present a variety of

appearances according to circumstances. Sometimes, when the part is exposed with forceps, there is little to see at first: the lesion is at the anterior or uterine end of the passage. In many instances there is protrusion of the second annular fold of mucous membrane through the external os; in others a hidous distortion, suggesting in appearance a small red cauliflower.

When not of too long standing, and unaccompanied by other and inaccessible lesions, cervicitis offers a fair chance of recovery under proper treatment. That treatment consists fundamentally in the use of suitable antiseptics applied directly to the diseased mucosa. Pure Lugol's solution (U.S.P.), silver nitrate in varying concentrations, and even 30 per cent formaline in water, have been used for this purpose. If they fail and the animal's value warrants such procedure, the cervix may be amputated, though this operation is one for experts only.

Uterine lesions are common enough. They vary, over a long scale, from startling accumulations of pus to chronic atony of the part, and include some conditions of great pathological interest, particularly those described by Hallman[34]. The organ is not as accessible as the cervix, however, and hence, though it may be palpated and massaged 'per rectum', and even in spite of its great inherent powers of repair, is not as satisfactory to treat. Lothe reports 55 per cent recoveries from 227 cases of endometritis.

Abnormalities of the Fallopian tubes and pavilions, unless well developed, can, as a rule, only be recognized when the examiner has a delicate and educated sense of touch. They offer no chance of recovery under present methods of treatment.

The ovaries are subject to many pathological changes, not all of which are by any means understood. Among the most interesting fields for research are those concerned with the ductless glands, and a large part of the ovarian function is ductless. Perhaps when the inter-actions of the *Corpus Lutem*, the ovarian stroma and the rest of the female tract are more thoroughly understood, one may speak with safety concerning them. Here, as elsewhere, pathology is forcing the pace for physiology and the ground is a too contentious one on which to tread heavily. For this reason no more will be said at present than that retained *corpora lutea* (inhibiting estrum) can be expressed 'per rectum' or 'per vaginam,' and that the glands in question are surgically accessible. So much for the female.

Bulls.—The role of the male animal in sterility, abortion and other breeding losses received little serious attention until comparatively recently. Even then it is to be regretted that some otherwise excellent work on the subject was apparently so steeped in orthodoxy that it became a search for one particular organism *B. abortus*, rather than an unbiased study of material and cases. Thus Schroeder[35], in 1917, isolated the Bang organism from a chronic epididymal abscess in a bull. Two years later, Buck, Creech and Ladson[10] found the same bacterium in the seminal vesicles of four bulls and in a testicular abscess of another. Possibly because of the rarity of this site for such "specific" infection, breeders were led to believe that the bull was not a very big factor in the spread of "contagious abortion." But things have changed.

In 1920, W. W. Williams[36] published an account of the genital examination of eight bulls that were sexually unsound, together with case histories and a description of his methods for collecting and examining the semen of these animals. Aside from inflammation of the penis, testes

2. Feeding sound calves from unsterilized utensils previously used by diseased ones;

3. Cohabitation, via bedding, stalls, fittings, etc., and directly.

These diseases are highly fatal. Even when handled energetically and promptly, the results, while encouraging, are far from perfect. But therapeutics is without the scope of this paper and, even now, we are considering post-natal conditions of a highly contentious character.

There is a further point in this connection which commands attention. It is the influence of the calf's health upon its fertility when breeding age is attained. That there should be much, if any, connection between them sounds highly improbable at first. There seems to be a very direct relationship, however, which is both interesting and important for it further links diseases of the new born to other breeding losses, though in this instance, the losses occur in the next generation.

Evidence is scant but definite. It seems to be limited to two herd studies by Williams[41, 12], which can easily be outlined in brief. In the first of these herds the calves were born of genitally infected cows and raised under filthy conditions for six successive years. As heifers in their first pregnancy such calves aborted at the rate of about 50 per cent. Sterility was high. Conditions were then changed and a hygienic system of calf raising followed. Heifers brought up under the new regime and bred to essentially the same herd bulls aborted at less than one-sixth the previous rate—8 per cent.

The second herd furnished material for a numerically large study lasting seven and a half years. It was tubercular and cursed with genital infections which manifested themselves in every form. In the 40 months under review 593 heifer calves were born of which only 170 eventually conceived. Of these 95 calved; 75 aborted.

At the close of this period, certain changes were made. Among them were the institution and proper use of maternity stalls; the feeding of pasteurized or at least heated milk; the avoidance of crowding. During 50 months of this improved practice, 904 heifers were born, 382 of which conceived. Of the latter, 203 calved, 22 aborted and 157 were pregnant at the time of writing. Commenting on this Williams writes—"The most striking difference between the behaviour of the two groups of calves when they reached breeding age is in the rate of abortion. In the first group 55·9 per cent calved and 44 1 per cent aborted; in the second group 90 2 per cent have calved and 9 8 per cent have aborted. We have been unable to find any explanation for this change in the rate of abortion except the method of feeding the heifer calves."

At this point it is interesting to note what the Departmental Committee of the British Board of Agriculture and Fisheries had to say on the subject in 1905 Considering *epizootic abortion as it occurs among bovine animals* the Committee's report states with reference to infection by way of mouth—"In fact we are inclined to believe that the disease is more frequently contracted in this way than in any other." The committee was, of course, strictly orthodox, but the point is one on which the two are singularly in accord.

Control of Breeding Losses

This is scarcely the place to discuss control measures for breeding losses at any great length; still the preceding would be futile if some practical lessons could not be learned from it. Two such lessons stand out. One is that *orthodoxy* of the old type has not justified its existence. Practically it has failed to appreciabl-- raise

breeding efficiency; theoretically it is narrow and does not admit all the facts. We predict its death.

The other is that if a genitally unsound animal of either sex is bred or, worse, if two such animals are mated, one cannot logically expect a sound result. Whether that result will be sterility, abortion, a still birth, infected calf, retained placenta, fatal metritis, or something else, it is nearly impossible to predict.

The avoidance of all these failures depends upon adherence to two simple rules propounded by Williams[43] some years ago and already touched upon:—

1. Mate only genitally healthy adults;
2. Guard the health of the new born.

These two simple statements are the essence of sanity in breeding matters. Their application, however, is not so simple. To begin with there is the question of how to determine genital health when animals have attained breeding age. If the genitalia were all external, perhaps it would be easy, but they are not so and, therefore, an expert consultant is required. It becomes the duty of this veterinarian when examining a herd to pick out (1) animals fit and ready to breed, (2) those requiring medical or surgical treatment, and (3) those whose reproductive capacity is lost. Group three should be promptly got rid of. Animals in group two must be given such treatment as will fit them for group one or discarded.

An inspiring illustration of the effectiveness of this procedure has been given by W. W. Williams[44]. In 1917 he undertook supervision of a large dairy herd which was saturated with both genital infections and tuberculosis. It was decreasing numerically at a fast rate. During that year only 53 per cent of the females became pregnant, and of these 62·3 per cent calved, 37·7 per cent aborted. After three years of highly instructive effort, a herd inventory showed that conceptions stood at 85 per cent, calvings at 90·4 per cent and abortions at 9 6 per cent. During this time the average number of breeding females had decreased 14 per cent, but the calves and heifers under breeding age had multiplied by three. There is no record which begins to compare with this.

The second point, concerning the health of the calf, has already been dealt with sufficiently. Its bearing upon life and subsequent reproduction is of the greatest importance to breeders.

If one may draw any conclusion from all the work published on this and kindred subjects to date, it is that common sense, competent supervision and close co-operation between the breeder and his veterinary adviser seem to afford the only avenue of escape from one of the greatest menaces to the whole cattle business.

LITERARY REFERENCES

1. Williams, W. L.—Cornell Veterinarian. Vol. 9, 1919, Ithaca, N.Y., p. 204.
2. Williams, W. L.—Annual Report, N.Y. State Veterinary College, Ithaca, 1917-18, pp. 90-91.
3. Williams, W. L.—Cornell Veterinarian, Ithaca, N.Y., Vol. 12, 1922, p. 3.
4. Albrechtsen, J.—Cornell Veterinarian, Ithaca, N.Y., Vol. 7, 1917, p. 57, *et suiv*
5. Miller and Sims.—Canadian Veterinary Record, Toronto, Vol. 3, 1922, pps. 164-6.
6. Nocard, E.—Recueil de Méd. Vét., Paris, 1886, p. 669.
7. Groome and McCoy.—Journal American Veterinary Medical Association, Sept. 1922.
8. Bang, B.—Journal Comparative Pathology, London, Vol. 10, 1897, p. 125.

9. See Cotton, W. E.—Journal American Veterinary Association, Aug. 1919, p. 506.

10. Buck, Creech and Ladson—Journal Agricultural Research, Washington, Vol. 17, No. 5, Aug. 1919.

11. McFadyean and Stockman.—Jo. Comp. Path. London, Vol. 22, 1909, p. 264.

12. Fitch, Boyd and Billings.—Jo. A.V.M.A., March 1919, p. 681, *et suiv.*

13. British Departmental Committee.—Report Board of Agr., London, 1905.

14. Rettger, White and Chapman-Storrs Agr. Expt. Stn., Bull. 108, Nov. 1921.

15. Schroeder, E C.—Jo. A.V.M.A., Feb. 1922, p. 542 *et suiv.*

16. Williams, W. L.—Report N.Y. State Vet. Coll., Ithaca, 1920-21.

17. Williams, W. L.—Report N.Y. State Vet. Coll., Ithaca, 1918-19, p. 112.

18. Ascoli, A.—Zietschrift F. Infektionskr. u.d. Hausterie, Berlin, Band 17. Heft 3 and 4., Nov. 1915.

19. Williams, W. L.—Cornell Veterinarian, Ithaca, N.Y., 1922, p. 110.

20. McFadyean, J.—Jo. Comparative Path. London. London, 1921, Vol. 34, pps. 48, 105 and 191.

21. Albrechtsen, J.—Cornell Vererinarian, Ithaca, N.Y., 1917, Vol. 7, p. 57.

22. Stockman, S.—Jo. A.V.M.A., Aug. 1919, p. 499.

23. Smith, T.—Jo. Experimental Medicine, Vol. 28, 1918.

24. Smith, Little and Taylor.—Jo. Experimental Med., Vol. 32, 1920.

25. Thomsen Axel.—se Comp. Path., London, Vol. 33, 1920, p. 212.

26. Moussu, G.—Quoted from Williams, (29).

27. Carpenter, C. M.—Rept. N.Y. State Vet. Coll., Ithaca, 1920-21, p. 67 *et suiv.*

28. Williams, W. L.—Rept. N.Y. State Vet. Coll., Ithaca, 1918-19, p. 112 *et suiv.*

29. Williams, W. L.—"Diseases of the Genital Organs of Animals," Ithaca, 1921.

30. Hopper, E. B—Jo. A.V.M.A., March 1922, p. 742.

31. Giltner and Bandeen.—Jo. A.V.M.A., April 1920, p. 46 *et suiv.*

32. Udall, Cushing and Fincher.—Cornell Vet., Ithaca, Vol. 13, April 1923, p. 174.

33. Lothe, H—North American Veterinarian, Evanston, Ill., Sept. 1922.

34. Hallman, E. T.—Cornell Vet., Ithaca, Vol. 9, 1919, p. 28 *et suiv.*

35. Schroeder, E. C., and Cotton, W. E.—Amer. Jo. Med., Vol. 12, No. 2, Feb. 1917.

36. Williams, W. W.—Cornell Vet., Ithaca, Vol. 10, 1920, p. 87 *et suiv.*

37. Gilman, H. L.—Jo. A.V.M.A., Jan. 1922, p. 416.

38. Williams, W. L.—Jo. A.V.M.A., June 1923, p. 281.

39 Williams and Carpenter.—Rept. N.Y. State Vet. Coll. Ithaca, 1917-18, p 51, etc.

40. Williams, Hagan and Carpenter.—Jo. A.V.M.A., May 1920, p. 125.

41. Williams, W. L.—A.V.M.A., Aug. 1920, p. 553.

42. Williams, W. L.—Rept. N.Y. State Vet. Coll., Ithaca, 1915-16.

43. Williams, W. L.—Cornell Veterinarian, Ithaca, Vol. 9, 1919, p. 9.

44. Williams, W. W.—Cornell Veterinarian, Ithaca, Vol 12, 1922, p. 19.

A VISIT TO BRITISH SHOWS, FLOCKS AND HERDS

By J. G. ROBERTSON, Live Stock Commissioner, Saskatchewan

MY services having been lent by the Department of Agriculture to the Saskatchewan Sheep Breeders' Association and the Saskatchewan Swine Breeders' Association for the purpose of selecting and assisting in the purchase of breeding animals for the members of these Associations, I spent a couple of months in Great Britain this summer, and was able to attend most of the larger live stock shows as well as to visit many of the important breeders of sheep and swine.

This opportunity to secure new blood for our flocks and herds occurred through the offer of the Dominion to help, financially, in the im-

portation of rams and boars under certain conditions. Saskatchewan was the only Western Province to respond, but the four largest Eastern Provinces also aranged to make importations. The great success of a small importation of Shropshires by the Saskatchewan Sheep Breeders' Association in 1920 made the Saskatchewan breeders very anxious to grasp the present opportunity; and it is expected that good results will be obtained from this new purchase in the course of time; new blood having been secured in Shropshire, Oxford and Border Leicester sheep and in Yorkshire, Berkshire and Tamworth swine.

British Shows

The writer accompanied Mr McLauren, Mr. O'Neill and Mr. McEwen in a visit to several of the larger shows including The Royal Counties Show at Southampton, The Three Counties Show at Malvern, The Edinburgh Show, The Highland Show at Inverness, and The Royal Agricultural Show at Newcastle.

A Canadian is impressed first of all at these shows by the fact that they have no permanent equipment. Shows are held in different locations each year, and live stock and machinery are housed under canvas during the period of the show There are no walks other than the natural turf. Yet, in spite of this arrangement, the live stock is comfortably housed and there is practically no mud in the show yard. British shows have no midway attractions, so that the interest of the people who attend is concentrated upon the live stock and machinery exhibits.

All classes of live stock are judged upon the first day of the show, and exhibitors are compelled to display a card over each animal showing what he has won in this particular show. Horses and cattle are paraded daily after the first day. These parades are very well managed, very fine, and attract a great many people into the grandstand. Following the parades, the classes of jumpers are judged in front of the grandstand, and these classes to a certain extent take the places of the automobile races frequently run off at Canadian shows. The system of charging a high admission fee on the first day of the show and decreasing amounts each following day appears rather odd to one accustomed to the Canadian system. For example, at The Royal the admission on the first day of the show is ten shillings, on the second day five shillings, on the third and fourth day three shillings each, on the fifth day two shillings. Naturally, the attendance on the first day is very limited For example, on the first day at this year's Royal only 3.600 people purchased tickets, while on the third day over 63,000 paid admission.

I was impressed with the general excellence, not only of the live stock, for which Great Britain is famous, but also by the size and variety of the machinery exhibits. The machinery, implement and engine exhibits at these shows were very much larger and more interesting than I had anticipated. For example, the machinery exhibit at Southampton would compare very favourably with the machinery exhibit at any show in Western Canada. Musical bands are not used at these shows unless the show wishes to pay an extra tax, so consequently I did not see any military or civil bands at any of the live stock shows in Great Britain.

One at once notices the variety of the breeds seen at some of these shows. Many breeds which are totally unknown in this country in some cases come out in large classes. At the same time one is impressed by the absence of some of the most prominent breeds, which shows that breeds are more localized in Britain, small as the area is, than they are in the United

States or Canada. For example, the Royal Counties Show at Southampton, one of the largest shows in England, had no classes for Yorkshire or Large White swine, and The Three Counties Show, which includes Hereford, Worcester and Gloucester, had no exhibit of Guernsey cattle, although they were out in large numbers at Southampton; and of course the shows in the northern parts of England seldom have classes for Gloucester Old Spot pigs or Wessex Saddlebacks which are so popular in the south. Clydesdales were the only heavy draft horses shown at the Scottish shows, and while they are shown at shows in the north of England they do not appear at the shows in the south, where on the other hand the Shire, Suffolk Punch and a few Percherons hold the field.

In cattle at The Three Counties Show Herefords naturally were first in importance, followed by the Shorthorn, Angus, Red Poll, British Friesian, Gloucester, Longhorn, Dairy Shorthorn, Jersey, and Dexter. The Gloucester, the Longhorn and the Dexter are breeds unknown in this country. In sheep there were classes for Shropshire, Hampshire, Oxford, Kerry Hill and Cotswold, but no classes for Leicester, Lincoln, Dorset or Southdown. In swine, at the same show, Gloucester Old Spots held pride of place followed by Wessex Saddlebacks, Large Blacks, Large Whites or Yorkshires, Middle Whites, and Tamworths.

The Royal Agricultural Show

The leading Agricultural Show of Great Britain, and probably the greatest Agricultural Show in the Eastern Hemisphere, is conducted by the Royal Agricultural Society of England. This is purely an agricultural undertaking, and is truly a wonderful display of the very best live stock that can be assembled. Take it on the whole, with its various breeds and the general excellence maintained throughout, it probably excels any show in the world. There are certain breeds, however, which would have to take second place to the classes in several American and Canadian exhibitions, and in two or three breeds it frequently is surpassed by The Highland, the great show of Scotland.

The Royal, which was held this year in the city of Newcastle, was a success in every way. The attendance was greater at The Royal Shows for the last few years, and the exhibits were quite up to standard. Being a purely agricultural show without any noisy and money spending attractions, the attendance is naturally not as great as it would be did the directors favour this method of attracting the pleasure-loving crowds, but it means that the thousands of people who do attend are genuinely interested in some phase of agriculture. The attendance at this year's Royal totalled slightly under 190,000 people There were twenty breeds of horses shown, twenty of cattle, twenty-two of sheep and ten of pigs, besides large numbers of varieties of poultry and goats.

Among the breeds exhibited which are rarely or never seen in this country, were many breeds of light horses or ponies, and in cattle, such breeds as Lincolnshire Red Shorthorn, Devon, South Devon, Sussex, Welsh, Dun and Belted Galloway, Blue Albion, Park Cattle, Kerry, and Dexter. The breeds of sheep that we are not familiar with were Ryeland, Kerry Hill, Wensleydale, Exmoor Horn, Herdwick, Swaledale, and various mountain breeds.

The American breeds of swine such as Duroc Jersey and Poland China were absent, but their places were taken by Large Black, Gloucester Old Spot, Lincolnshire Curly Coated, Cumberland, Wessex Saddleback, and the Essex pigs. The two latter

breeds evidently come from the same original stock as the Hampshire hog of the United States.

The horse classes were not particularly large but were of excellent quality; the Clydesdale having as large an entry as the Shire, which is not usually the case at The Royal. A pleasing feature was the great interest shown around the judging ring, hundreds of spectators watching the placings, and by their discussions and comments, showing that they were intensely interested in the various breeds of live stock. If this spirit could be inculcated into our exhibition crowds it would be beneficial both for the live stock shows and for the spectators themselves.

In justice to our own shows, however, it must be said that in proportion to population we draw much larger crowds to our exhibitions, but when we do get the crowds there, they devote a very large share of their attention to the midway and the grandstand attractions. Perhaps it would be feasible to have a live stock parade more than once during the exhibition, as is the present practice at our western shows.

The Highland Show

The Highland this year was held in the quaint and historic old city of Inverness, the capital of the Highlands, and the people of the north gave the show a real Highland welcome. The show itself was of course smaller, and the number of breeds of live stock competing were fewer than at the Royal, but the breeds represented contained many of the finest animals of their kind to be found in Great Britain. The representatives of the Scotch Shorthorn, Angus, Clydesdale, Ayrshire breeds, and many others, were among the best to be found in any country, and it was an education in itself to walk around and examine these splendid animals.

The show was held in a picturesque spot beside fairy haunted Tomnahurich close to the city, and the presence of quite a number of gentlemen in the kilts of their various family tartans gave colour and variety to the scene. The various Highland woollen mills had very excellent stands on the grounds, displaying the very finest Scotch tweeds and tartans. The machinery and implement displays were excellent, and the show, while not extremely large, was very successful, and the attendance practically double that recorded when the show was last held in Inverness in 1911.

Lovers of the Shorthorn would have been glad to have seen Mr. Marshall's noted bull, Bridgebank Paymaster. This bull has been champion at The Royal and champion at The Highland for three years in succession, and well deserves the honour, for he is a beautiful roan, showing great scale, smoothness, quality, and Shorthorn character. Aberdeen Angus men would have found much to interest them around the Angus ring, culminating in the contest between Romping Rover and Black Knight of Auchterarder, resulting in the first mentioned winning the championship. This, of course, was a great disappointment to the supporters of Black Knight, which had won the championship at The Royal for three years in succession and had been champion at The Highland in 1921 and 1922.

The shaggy picturesque Highland breed was well represented, and so were the Galloway, Ayrshire and British Friesian breeds. Red Polls of good type were also exhibited, probably for the first time in the North. In looking over the catalogue I was surprised for an instant not to see any section for Clydesdale horses, but soon found that they were shown under the heading of "Draft Stallions" and "Draft Mares,"

which shows that other heavy draft breeds have not been able to obtain a foothold in the land of the Heather. The stallion champ'onship was awarded to the well known Fyvie Sensation, and the reserve going to his son, Benefactor, winner of the championship at The Royal a couple of weeks previously. Both are owned by Andrew M. Montgomery of Netherhall, Castle Douglas.

The championship in mares was won by a filly foaled in 1920, Raysun, owned by the well known breeder John P. Sleigh of St. Johns Wells, Fyvie; th's filly also winning the Cawdor Cup.

The sheep sections were filled with some very fine specimens of the Scottish breeds. Particular mention must be made of the picturesque Black Face and of the proud looking Border Leicester. Excellent Cheviots, Oxfords and Suffolks were on show, and Mr. T. A. Buttar was present with some splendid representatives of the Shropshire breed.

The most popular breed of swine in Scotland is the Large White, but Large Blacks are rapidly overtaking them, and Middle Whites are also fairly popular. There were quite a number of Cumberland pigs shown, but the displays of Berkshires and Gloucester Old Spots were small and Tamworths were entirely absent.

The poultry exhibit was, like the one at The Royal, very excellent with Wyandottes, Plymouth Rocks, Orp'ngtons, and Leghorns the most numerous, but Scotch Greys, Light Sussex, Dorkings and many other varieties were shown.

In addition to being a great live stock show and having many machinery and industrial stands, there were some educational booths on the grounds such as the stands of the North of Scotland Agricultural College, the Veterinary College at Ed'nburgh, the Government Forestry Exhibit and several others, all of which were interesting and valuable.

British Flocks

I was able to see only a limited number of the flocks of Great Britain, and naturally confined my visits to the breeds from which I wished to make purchases namely, the Shropshire, Oxford Down and Border Leicester; although at the larger shows I was able to see many fine animals of other breeds, including some very good Ryeland and Kerry Hill, two breeds that are at present almost unknown in this country.

The home of the Shropshire is, of course, in the county after which the breed is named, and with Shrewsbury as headquarters, a visitor can inspect the flocks belonging to most of the famous breeders. Mr. Alfred Mansell, Secretary of the Shropshire Society, lives at Shrewsbury, and of course is very familiar with all the flocks, not only in Shropshire but of the breed throughout Britain.

It was very interesting to inspect such flocks as Tanner's, Everall's, Nunnerley's, Bibby's, Mrs. Inge's, Brown's, Minton's, and others. A very fine two-shear Shropshire ram was purchased from Wm. Everall, his sire being a first prize winner at The Royal in 1920. A shearling was also purchased from Mr. Everall, a ram lamb from Mr. Nunnerley and a shearling from Mr. Tanner, this shearling being in the first prize pen at The Royal this year where the competition was very keen. Outside of Shropshire and the surrounding counties the most noted source from which to secure good stock is the famous flock belonging to Mr. Thomas Buttar, of Corston, Cupar-Angus, Scotland. Several good shearling rams were secured from this flock after careful inspection by Mr. A. E. McLaren and myself.

In searching for good Oxfords for Saskatchewan breeders the flocks of

such men as Hobbs, Stilgoe, Penson, Reading, Akerman, Akers & Co., Watt & Sons, and several others in England, and the best known Scottish breeders such as T. & M. Templeton, Robt. Graham, Wm. Malcolm, Jas. Jeffrey, and others. Some choice Oxford ewes were purchased from Sydney Reading and from the veteran breeder Mr. J. R. Akerman, both in Oxfordshire. Rams were purchased from Frederick Penson, who is such a frequent winner at The Royal, and who won the championship there again this year; from Jas. Jeffrey, of Duchrie, Scotland, from T. & M. Templeton, of Sandyknowe, from Robt. Graham, of Kaimflat, and a very good Oxford ram lamb was purchased from Henry Akers & Co., the breeder who did well in the lamb classes at The Royal this year.

Mr. McLaren and myself found that the English and Scottish breeders of Oxfords are breeding for a type that is excellent as a mutton sheep but does not possess the quality of wool which we are so anxious to secure in this country. They believe that a type which has a very black face and black legs is more hardy and robust than the types that are more of the chocolate or brownish grey in colour. However, when they get very black faces they also get black hairs or fibres appearing in the adjoining portions of the fleece, and the presence of such fibre is very objectionable from our standpoint; consequently the selection of Oxfords was more difficult than of Shropshires or Border Leicesters.

Border Leicesters, such as we saw in northern England and southern Scotland, possess better fleeces and produce a better quality of wool than do the Border Leicesters in this country. Many excellent flocks were visited; particular mention, perhaps, should be made of the flocks of Messrs Jeffrey, Kinnaird. Malcolm, Ross, Montgomery, T. & M. Templeton, and the Earl of Balfour. Purchases were chiefly made from the flock of A. M. Montgomery of Castle Douglas, who won first at The Royal with his two-shear ram.

Twenty head of breeding rams and ewes were purchased for Saskatchewan breeders, and I hope that they will make the long journey without mishap and arrive in good condition.

British Herds of Swine

In swine as in sheep the Old Country farmers spread their energy over a great number of breeds. There were twenty-two breeds of sheep at The Royal and ten or twelve breeds of pigs; many of which not being of good bacon type are not at all suitable to this country. The three most popular breeds in Great Britain at the present time are the Large Black, Large White and Middle White. The Large White is the breed which is known as the Yorkshire in Canada, and they have many good herds in Great Britain.

Mr. McLaren and myself were able to purchase Yorkshires for Saskatchewan breeders from some of the best herds in Great Britain. A boar was purchased from the best herd in Scotland, the Dalmeny herd owned by the Earl of Rosebery. A boar and sow were purchased out of the Walton & Worsley herd owned by Sir Gilbert Greenall, the sow being a grand-daughter of their famous boar, Worsley Jay 35th, which was four times champion at The Royal. Two boars were purchased from the Hallastone & Holsby herd, one of which was already a prize winner and out of a sow that had been a noted prize winner. Two more boars were purchased from the Spalding herd, one of the most famous herds in Great Britain, owned by Mr. Alfred White in Linconshire.

One of the most successful breeders of Large Whites is Mr. Thomas Wherry of Bourne. Two boars and two sows were purchased from his

herd, and a litter brother of one of the sows won 1st prize in a strong class at The Royal about two weeks after my visit and purchase. Two sisters of the other sow, but out of an older litter, were respectively first and third at The Royal. Three very good boars were secured from the herd of the Crighton Royal Institute at Dumfries, Scotland, and in all a total of 14 Large Whites were purchased for Saskatchewan.

One naturally expected to find a considerable number of good Tamworths in England, for the Tamworth is one of the oldest and purest of British breeds, and is regarded with high favour by the bacon trade. Needless to say, I was very much surprised to find that this historic breed has apparently fallen upon evil days, for the good herds of Tamworths are exceedingly few. The majority of them are in Warwickshire, the most outstanding herd outside that county being the Tamworths belonging to Major Morrison, of Basildon Park, near Reading.

The most famous present day breeder of Tamworths is Mr. Robert Ibbotson, of Knowle, near Birmingham, and an outstanding boar was purchased from this breeder, being sired by The Royal champion, and his dam winning the female championship at The Royal this year. With the exception of two or three herds, the Tamworths seen in England were disappointing, and they appear to be decreasing in numbers and popularity. Possibly their real merit will some day bring them back into greater favour again.

There are many fine Berkshire herds in England but only one or two good herds in Scotland. The English Berkshires, while they are good animals, possessing good quality, smooth shoulders, and easy fattening qualities, do not possess the length of side which we are endeavouring to secure in our Berkshires in Canada; consequently although quite a number of herds were inspected, purchases were made only from the noted herd belonging to the Duke of Westminster. These animals carry some of the best blood in his herd, being second generation from his famous stock boar, War Loan, and one of them being out of his good sow, Eaton Warrioress.

A large percentage of British pigs are killed for fresh pork trade; consequently the breeders do not attempt to cater to the bacon type. This fact accounts for the popularity of many breeds that are certainly not of a type to produce the very best bacon. Space does not permit mention being made of the cattle or horse establishments visited while in the Old Country, nor of a very interesting visit to Denmark.

It may be safely stated, however, that Britain richly deserves its reputation as a breeding centre for the majority of the breeds of domestic animals, which have proved their worth on both continents; and while a large number of mediocre animals naturally are produced, her most expert breeders are producing types and strains that will probably keep them in the forefront indefinitely and maintain their present high reputation.

THE AGRICULTURAL SOCIETIES OF ONTARIO

By J. LOCKIE WILSON, Superintendent

THE honour of holding the first Agricultural Fair in Canada falls to Windsor, N.S., in 1765, 158 years ago, and soon other Agricultural Societies fell into line in Nova Scotia, including one at Halifax in 1789 and another in King's County. This latter is the only one of the old Societies in the Maritime Provinces that has survived the present day. The prizes offered at Windsor were in goods and medals. To the persons bringing the greatest number of cattle were awarded three yards of English blue superfine broadcloth and a silver medal. For horses, a saddle, bridle, whip, spurs and a medal were the rewards, and a churn for the best cow, while for the best twelve pounds of butter or cheese the prize was six yards of ribbon and a medal.

The progress of organizing Agricultural Societies in a newly settled country was naturally slow at first; but it is worthy of mention that the first Province to introduce imported stock was New Brunswick, which brought over, in 1826, four Shorthorn bulls, which were recorded in the first volume of the English Herd Book. A provincial exhibition was held in Fredericton, N.B., in October, 1852. An Agricultural Society was organized in Montreal in 1788 and another in Quebec in 1789.

Settlement in Ontario commenced in 1783, and in 1791 had progressed sufficiently along the Niagara river and peninsula to justify the formation of an Agricultural Society on October 28 of that year. This pioneer Ontario society had its headquarters at Niagara-on-the-Lake, then known as Newark. Governor Simcoe took a great interest in it and was its first president. The first efforts of its members were directed to the holding of monthly meetings to discuss agricultural questions, and an agricultural library was also established. The holding of an exhibition naturally followed.

Agricultural Societies gradually became organized all over Ontario, as settlement in the province progressed. In 1830, the Legislature passed regulations governing same and set apart grants. Eight hundred dollars was apportioned to each District Society to enable it to hold an exhibition in addition to the work it had previously undertaken.

An Agricultural Society for the County of York was organized in 1830. Seeds and implements were procured from the Old Country for members. A progressive member was sent to New York State who purchased four bulls for the use of the Society. Soon after an exhibition was held, and prizes were awarded for essays on agricultural subjects.

In 1845 a Provincial Association was formed, and in 1846 the first Provincial Fair was held in Toronto, out of which have grown the world-wide-known Canadian National Exhibition, the Western Fair and the Central Canada Exhibition.

The Provincial Association gradually became better organized and developed into the Agriculture and Arts Association, which did so much for the improvement of agriculture in the province in the earlier days. Among the many useful lines of work inaugurated were the establishment of the Veterinary College, the registering of pure bred stock, the awarding of prizes for the best kept farms and buildings and well cultivated fields, and, indirectly, the Agricultural College at Guelph.

Agriculture soon became such an important feature in Ontario that a Commissioner of Agriculture was ap-

pointed; and eventually the Provincial Government created a Department of Agriculture, thus recognizing this basic industry as of equal importance with those which came under the supervision of the other departments of the Government. Thus out of that little society organized in 1791 in old Niagara-on-the-Lake, with a score or less of competitors and a modest prize list of a few pounds, have developed not only the three great exhibitions at Toronto, London and Ottawa, and hundreds of fairs and exhibitions in the province, but also the important Department of Agriculture with its numerous branches and with local representatives in every county and district, bringing information and assistance to farmers desirous of making use of it.

With the increase in the number of pure bred horses, cattle, sheep, and swine in the province, breeders vied with one another in exhibiting their stock at fairs and exhibitions, and gradually Agricultural Societies discontinued some of their lines of work, important though they were, and concentrated their efforts on fall fairs. Some of these features, which are still recognized in *The Agricultural Societies Act* as part of their work, have since been taken up by other organizations. For instance, the Ontario Ploughmen's Association has held ploughing matches in all sections of the province. These in the earlier days were conducted by Agricultural Societies. An old report refers to two ploughing matches held under the auspices of the York Agricultural Society in 1830, at which the prizes were £3, £2, and £1, and mentions that at one of these matches the first prize went to a Scotchman.

The three hundred and sixty Agricultural Societies in the Province of Ontario have made rapid progress of late years. In 1907 a new departure was inaugurated and a grant was made by the Ontario Government for the holding of Standing Field Crop Competitions, each society selecting the desired kind of grain or other crop grown for seed. Ten societies took part in that first competition and the initial grant was $1,000. In 1922, two hundred and eighty-five competitions were held and the grant was $28,500. For this competition, 152 judges were required to score the fields. In 1920 the Combined Field Crop and Threshed Grain Competitions were inaugurated and 1,000 farmers took part. The grain is first scored in the field, and, after being threshed, is examined in the bins. The prizes are awarded on a basis of 60 per cent on the field score and 40 per cent on the bin score. Only pedigreed seed is allowed to compete, and every competitor has to sow the same variety of grain. In the regular competitions two points are deducted from those sowing non-standard varieties. These Field Crop Competitions have resulted in additional interest being taken by farmers in the cultivation of their fields, with a consequent increase of production, and the additional care taken in cleaning the grain for seed has put them in a position to be able to meet the wide-spread demand for it, which has resulted in great financial benefit to the farmers concerned.

Those visiting the Canadian National Exhibition from year to year have noted the wonderful advancement made in the production of pure seed grain, for which Ontario is becoming noted through these Field Crop Competitions. Never was such a fine exhibit of field crop products shown at any fair on this continent as the one in the Government Building at that exhibition in 1923.

With the exception of ten societies, which devote their energies wholly to the keeping and maintenance of pure bred male animals for which

they receive certain grants, all the societies hold fall fairs and exhibitions. Spring stock and seed shows are also conducted with great success. In spite of the lessened attention paid to horse breeding by farmers on account of the advent of the automobile, the fairs of 1922 were the most successful held, the exhibits of both light and heavy horses being above the average, and other stock in the same degree. A feature that shows great improvement is the poultry exhibit, which is making forward strides each year. The Agricultural Societies of Ontario are certainly manifesting wonderful vitality and their excellent work meets with the approval of all concerned.

AGRICULTURAL REPRESENTATIVE WORK IN NEW BRUNSWICK

By J. E. McINTYRE, B. S. A., Bathurst, N. B.

THE Province of New Brunswick has had five years' experience with the agricultural representative system, and the question may well be asked, What of the results?

Agricultural progress in New Brunswick is not measured by an increase in the number of farms or of farmers, but by a higher standard of living, by material improvement among its farmers, and by the different attitude which now exists towards farming as an occupation.

The extent to which approved agricultural practices have been adopted in those counties where Agricultural Representatives have been maintained is a criterion of the influence this system has had in effecting the general progress, in so far as this can be attributed to the development of agriculture.

The agricultural representative is the promotion agent of government aid to Agriculture, and the "middleman" between the agricultural college and the farmer. He works through personal contact; hence he must discover the needs of those whom he can help before the manner of assistance can be determined. The first widespread attempt at organized marketing of an agricultural product in this province, the co-operative marketing of wool, was effectively promoted through his agency by a farm to farm canvass.

The status of the dairy industry at the time the county agricultural representative system was introduced, was another problem in the solution of which as a promotion agent the representative was signally useful. Too many small dairy factories existed in some parts of the province. Centralized co-operative creameries were an economic necessity. Co-operative effort to a greater extent than had existed among dairymen was necessary. In bringing the facts of the advantages of patronizing the centralized creamery to the patron the usefulness of the agricultural representative was again demonstrated. Inside of three years the organization for three centralized co-operative creameries was completed, cream routes were arranged, and the plants were successfully operating.

The scope for improvement in farm poultry afforded the Agricultural Representative a foothold for demonstrational and educational work among boys and girls. The distribution of hatching eggs, the holding of culling demonstrations, and the giving of instruction in the selection of

exhibition birds for school fairs, brought him into personal relationship where his counsel was appreciated. Through membership in these clubs, many enterprising and industrious boys and girls have become the owners of remunerative farm flocks which give them a keen interest in farm life.

Farm crops is a subject upon which the Representative's opinion is frequently consulted. As an instance: The farmers in one county desired to grow fibre-flax, and communicated with the local Representative, who took the question to the flax specialist. Valuable assistance was thus secured to the growers which made possible the growing of an extended acreage of this crop.

An acre-profit competition for boys in the growing of potatoes was conducted in Carleton County, the centre of the commercial potato growing section, with effective results Improvement work with this crop—comprising the dissemination of improved seed, encouragement in the use of home mixed fertilizers, the application of sprays, aid in rogueing, and demonstrations of the best cultural practices - is a line of effort wherein the Agr cultural Representative is actively participating. He has also been active in promoting interest in County Standing Field Crop Competitions, and County Seed Fairs.

The classes of instruction for farm boys, at winter short courses, in problems of special interest to the farmers of certain sections, have disclosed the permanent influence exerted by this kind of educational work. A midsummer judging competition, held at the Dominion Experimental Farm, Nappan, between teams chosen from the students of different centres where short courses were conducted, served to maintain interest in the study topic from one season to another.

All phases of the extension work carried on by the Provincial and Federal Departments of Agriculture are aided and assisted by the Agricultural Representative. The improved sires policy, the egg-laying contests, pulverized limestone applications, crop insect control, and the development of better markets for farm products are furthered at every opportunity among a population comprising both French and English-speaking farmers. The aim of the Representative has been to meet the farmer on his own farm and to extend practical aid

The movement is well launched, and has proved of signal effectiveness. It has brought to the farmer the realization that government aid is for him, personally, and it has shown itself to be a useful agency in coping with problems of agricultural education, production and marketing.

DAIRYING IN BRITISH COLUMBIA

By **HENRY RIVE**, Dairy Commissioner

DAIRYING in British Columbia is a relatively small industry if comparisons are made with other provinces of the Dominion. Until well within the last decade, few dairy cattle were to be found outside the Lower Mainland, including those portions of the province comprised in and adjacent to the Fraser River Valley. To-day the industry is well established on Vancouver Island, the Gulf Islands, and in the Okanagan Valley, while the more remote and hitherto sparsely settled districts of Central British Columbia, the Cariboo and the Columbia Valley have in recent years made good beginnings.

The comparative inaccessibility of these agricultural areas, with the difficulties encountered by settlers in

securing dairy cattle, operated for many years against the spread of the industry and rendered what surplus existed of dairy heifers in the older sections non-available for the newcomer in the newer parts. Several setbacks occurred, also, in the form of land booms, with consequent subdivision and speculation, together with undue attention to specialized fruit growing, to the great detriment of all live stock industries and of agriculture in general.

It is now recognized that with a few much localized exceptions dairying and mixed farming must form the basis of successful agriculture in British Columbia.

In several portions of the province corn yields well for ensilage, while enormous crops of roots can be secured in other parts. Alfalfa does well in the irrigated districts, and everywhere green mixtures such as pea-oat-vetch, etc., and red clover give excellent returns.

Of pure bred dairy cattle the four chief breeds are to be found, the Holstein and Jersey preponderating, Guernsey and Ayrshire in smaller numbers. Grade milking Shorthorns with good production are frequent, but there are no milking shorthorns of pure blood. Dairy Red Polls are represented by a couple of herds, but they are not popular nor likely to increase in number.

Notable records have been obtained by Holstein cattle in this province: Colony Grebegga Valdessa 62388 (641,256 A.H.H.B.), bred and owned by the Colony Farm, Essondale, B.C., world's champion in two year old class with production of 28,538 pounds milk and 889 pounds fat, or 1,111·25 pounds butter.

Agassiz Segis May Echo 41302, owned by the Dominion Experimental Farm, Agassiz, B.C., held until recently the world's championship, having produced 30,886 pounds milk, 1,345 pounds fat, and 1,681 25 pounds butter.

A large proportion of best yielders amongst Jerseys in the Canadian Record of Performance have their home in British Columbia, while high performance in local representatives of both Ayrshire and Guernsey breeds is present. The prospects for worthy dairy cattle within the province are, therefore, good if due attention is paid to breeding and weeding.

Cow-testing associations and cow-testing centres have been in operation for several years, mainly with grade herds, and good progress has been made. The average of all completed lactation periods recorded during 1922 showed a yield of 7,073 pounds milk and 316 pounds fat.

There are in British Columbia twenty-five creameries, three condenseries, two cheese factories, and several plants devoted solely to the manufacture of ice cream. One half of these institutions are co-operative, owned by the dairy farmers.

The total dairy production for 1915 was valued at $3,034,340; for 1922 at $8,001,135.

Prices for dairy products are uniformly somewhat higher than in the more eastern provinces, owing chiefly, no doubt, to British Columbia being still an importing province.

Several million pounds of butter and considerable cheese come in annually from without. Production, however, is steadily if slowly increasing, and it is estimated that, subject to increase in population, from six to eight years hence this province will be in a position to supply its dairy markets.

Splendid opportunities exist for intending dairy farmers to locate on the newer lands of the province in what are known as settlement areas. Where, by reason of lands remaining undeveloped, the progress of a district is being retarded, a Board has been empowered, under *The Land*

Settlement and Development Act and amending Acts, to include any area of undeveloped agricultural land in what is termed a "settlement area." Only tracts which have been found after careful inspection to be suitable for agricultural purposes are included in such areas. Valuations, which are based on this inspection, vary with location, quality of soil, etc.

The establishment of settlement areas has the general effect of providing land for settlers at reasonable prices. Many private owners are either improving their lands themselves to avoid payment of the penalty tax, or are now selling their holdings at reduced prices to conform to the reasonable values placed on similar adjacent lands by the Board's appraisers. It may therefore be said that the effect of the settlement area policy in the districts where it has been put into force has been to stimulate sales of unimproved lands to actual settlers and to regulate prices.

Settlement areas have been established in Central British Columbia along the Grand Trunk Pacific Railway and the Pacific Great Eastern Railway. Immense development of the dairy industry may, therefore, be looked for in the future, as these rapidly filling tracts are well suited to the growing of forage crops and the rearing of cattle.

DEPARTMENTAL CHANGES IN MANITOBA

UNDER a reorganization of the work of the Department of Agriculture of the Province of Manitoba, several important changes have been effected. In future the activities of the Agricultural Extension Service will be divided between the Department of Agriculture and the Department of Education. The Agricultural College, which is under agricultural jurisdiction, will assume control of extension work proper, while Boys' and Girls' Club work will be transferred to Education. Mr. S. T. Newton, formerly in charge of the Extension Service, has been transferred to the Department of Education, where he will have direction of club work in co-operation with the public school inspectors. Mr. N. C. McKay, formerly Assistant Director of Extension, will become Acting Director with headquarters at the Agricultural College. By this arrangement all duplication of educational activities will be avoided, and the club work, to the success of which the school inspectors have largely contributed, will become a part of the Department of Education.

Another important change is the discontinuance of the Agricultural Representatives. This is purely a measure of economy. Recently there have been only four men in the field, and although they have given excellent satisfaction, it is felt that under present conditions, the service cannot possibly be extended to all districts, and that therefore it can, without serious consequences, be eliminated in the few cases where representatives are still engaged.

PART III

Agricultural Education and Related Activities

AGRICULTURAL INSTRUCTION FOR JUNIORS IN ONTARIO

By R. S. DUNCAN, Director Agricultural Representatives, Ontario Department of Agriculture

Rural School Fairs

IN 1912, rural school fairs were adopted as a general policy of the Department of Agriculture and have grown by leaps and bounds, until in 1922 there were 490 rural school fairs, embracing 4,266 schools, with 111,974 pupils taking part. It is estimated that last year 157,486 pupils and 233,298 adults attended the fairs. In 1909 there were only 174 entries; whereas in 1922 it required 225,370 entry tickets.

Each school fair, comprising on the average nine schools, is managed by a rural school fair association, which is composed of representatives from each school, who are elected by ballot from among the pupils. The teacher conducts the election of directors, scrutineers are appointed to count the ballots, nominations are made by the pupils, and a wonderful interest is created at the start which carries through to the school fair. The directors from each school then meet and elect their own officers, consisting of a president, vice-president, secretary and treasurer, and a board of directors. This general Fair Board, under the supervision or guidance of the Agricultural Representative, has charge of the management of the school fair. The officers usually meet two or three times during the season to discuss the prize list and matters pertaining to the fair. Special duties are assigned each officer and director. The secretary keeps a record of the minutes; the treasurer in some cases opens a bank account, and prize money is paid by cheque, countersigned by the president. The youthful exhibitors are then encouraged to open a savings account in the local bank. Practically all the expenses in connection with school fair work, with the exception of the prize money, are paid by the Ontario Department of Agriculture. The amount required for prizes for each fair varies from $60 to $125, the average being possibly $75. This prize money must be secured locally from the trustee boards, township and county councils and from public-spirited persons.

Home Garden Contests

Closely associated with school fair work is a Home Garden Contest, for boys and girls from 12 to 18 years of age, and preferably for those who have graduated from the school fair. Sufficient seed is given to plant a garden 30 feet by 40 feet on the home farm. A pamphlet outlining the plan of garden and giving cultural instructions and suggestions is given to each contestant. The Agricultural Representatives judge the gardens in July and August, and award prizes for the best kept gardens. At the fairs, when prizes are awarded for exhibits, judges are instructed to take into consideration the quality of fresh and canned vegetables, the quantity of

vegetables canned from the garden and the display and attractiveness of the exhibt. Prizes are also offered for the best display of products from the home garden at the school or local township fall fair. These boys and girls are also encouraged to exhibit in the regular sections of the prize list of the local or county fair, and many have been extremely fortunate in winning honours and prizes.

Club Work

Boys' and Girls' Club Work in the Province of Ontario is only in its infancy, though it has made wonderful strides in some other provinces of the Dominion and in the United States. Where organized it bids fair to rival school fair work in its popularity. Perhaps this is due to the fact that boys and girls love animal pets—something that is alive and responds to kind treatment.

These clubs were designed to create in the boy and girl a deeper interest in live stock, to encourage boys and girls to keep records—a home project—and to teach them better methods of feeding and management. The work in Ontario so far has been limited to the organization of calf clubs, pig clubs, sheep clubs, potato clubs and poultry clubs, and was intended primarily for boys and girls from 12 to 18 years of age.

Course for Junior Farmers

The four to six weeks' Courses in Agriculture during the winter for farmers' sons have been a special feature of Agricultural Representative work since they were first started in 1912. They are held at a different point in the county each year, and thus eventually the boys in every part of the county have a course brought to their very door.

The object of these courses is not to teach the farm boy how to farm—practical work on the farm is the best teacher. Their motto should be "Learn Why, for that teaches How and When." The aim is simply to make a study of the underlying principles of agriculture, to induce the young man to enquire more closely into things, to make him acquainted with new and approved ideas and methods, and to instruct him where to look for information. If these courses do nothing more than teach the young man how to think, they pay and pay well.

A special two weeks' course in domestic science, home nursing or sewing for farm girls is usually held at the same time as the course in agriculture for the boys, and joint sessions are held where the lectures are of interest to both.

From 1912 to 1923 the Agricultural Representatives have held 384 month courses in agriculture with an attendance of 9,410 farm boys. This works out approximately to 32 courses per year, with an average attendance per course of 25 students.

While these four to six weeks' courses in agriculture serve a very useful purpose, it has been felt for some time that a larger number of young people in the rural districts would be greatly benefited by longer courses in agriculture and home economics during the winter months. Accordingly, an experiment was tried out during the season 1921-22 of conducting four three-months' courses in agriculture and home economics in the Counties of Huron, Peel, Middlesex and Wentworth. So successful were these courses, and so favourably were they commented upon by every person who came into contact with them, that the Department held eight such courses during the past season from November 27, 1922, to March 2, 1923. During the two years that the three-months' courses have been conducted, we have had a total attendance of 501 boys and 497 girls, or an average per course of 42 boys

and 41 girls. In addition to the agricultural and home economics subjects, special lectures were given for both sexes in English and mathematics, and of some of the older students, at least, it may be truthfully said that they appreciated these periods as much if not more than any other.

Literary societies, organized by members of the classes, constitute one of the important features. Students are given an excellent opportunity to take part in debates, deliver addresses, give impromptu talks, take part in discussions and conduct meetings in parliamentary style.

Junior Farmers' Improvement Association

The Junior Farmers' Improvement Association is an outgrowth of the courses in agriculture. It was felt that there should be some organization by which the young men might be held together in order that the new ideas received, the new methods learned and the interest and enthusiasm aroused would not fall on barren ground and remain dormant. These associations have a four-fold object, namely, educational, social, research and investigational, and financial.

To date we have 109 Junior Farmers' Improvement Associations with a membership of 3,118. Where organized, they are a positive force in rural life. I know of no organization which has as bright a future and through which the Agricultural Representative can do such effective work.

Live Stock Judging Competitions

Live stock judging competitions for junior farmers, which have been a special feature of the Winter Fairs at Guelph and Ottawa and the exhibitions at Toronto, Ottawa and London for the past few years and at the Royal Winter Fair last year, have created a wonderful interest. The inter-county contests stir up rivalry, and live stock breeders watch the results with more than ordinary interest. These young men get an excellent training in judging live stock, learn to appreciate good pure-bred animals, and hence are not contented unless they can commence building up their herds.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

ACCREDITED HERD REGISTER

THE following is the list, by provinces and breeds, of Canadian herds of cattle which on September 1, 1923, had been fully accredited as to freedom from Bovine Tuberculosis by the Veterinary Director General. Supplementary lists of herds subsequently accredited will be published in future issues.

An account of the Accredited Herd System was published in the February, 1923, number of The Agricultural Gazette, pp. 24-27, "Bovine Tuberculosis in Canada."

PRINCE EDWARD ISLAND

AYRSHIRE

Aitken, William, Lower Montague
Auld, R. Brewer, Freetown
Annear, Geo., Montague
Boswald, Geo. L., French Port
Brown, Bert R., York
Cairns, F. L., Freetown
Cairns, R. L., Freetown
Experimental Farm, Charlottetown
Ferguson, C. T., Marshfield
Miller, W. A., Charlottetown
McLean, C. D. & Sons, Clyde River
MacRae Bros., Brookfield
Reid, Edwin, Rollo Bay
Rodd, T. A., Milton
Younker, W. R., Charlottetown

HOLSTEIN FRIESIAN

Bovyer & Turner, Charlottetown
Gibson, W. J., Marshfield
Godfrey, Chas. & Geo., North Wiltshire
Jones, J. Walter, Bunbury
McCallum, W. E., Southport
McKay, Alex. R., Charlottetown
Morrow, A. W., North Lake
Stewart, Cecil J., Hampshire

JERSEY

Easter, Edgar, North Wiltshire
Glydon, Frank & Son, Kensington
McKay, Alex. R., Charlottetown

SHORTHORN

Auld, R. Brewer, Freetown

NOVA SCOTIA

AYRSHIRE

Byers, E. R., Old Barns

GUERNSEY

Corson, H. C., South Ingonish

HOLSTEIN-FRIESIAN

Experimental Farm, Nappan

JERSEY

Boulden, C. Eric, Windsor
Cann, C. & H., Chegoggin

SHORTHORN

Archibald, C. A., Truro
Experimental Farm, Kentville
Stewart, E. R., Old Barn
Tory, J. C., Guysboro

NEW BRUNSWICK

AYRSHIRE

Atkinson, H. W., Fredericton
Dom. Exp. Farm, Fredericton
Snowball, R. A., Chatham

HOLSTEIN-FRIESIAN

Dom. Exp. Farm, Fredericton

JERSEY

Manchester, J. H., Apohaqui

SHORTHORN

Snowball, R. A., Chatham
Dom. Exp. Farm, Fredericton

ONTARIO

AYRSHIRE

Ballantyne, John, Atwood
Begg, Melvin, Moose Creek
Benning, Jas., Williamstown
Brown, Chas., Burford
Bruce, Dr. H. A., Eglinton
Cairns, Peter, Brantford
Cambell, J. McNab, Dalkeith
Collver Bros., Wellandport
Connolly, W. J., Strathroy
Cotton, Jas., Navan
Cowan, Jos., Silverdale
Cughan, Abel, Athens
Cumming, Donald, Lancaster
Cummings, Malcolm, Lancaster
Dalrymple, A. J., Bismark
Dalrymple, J. A., Bismark
Deeks, Thos. L., Williamsburg
Ducks, W. P. & F. E., Grassie
Dyment, Humphrey, Lancaster
Dyment, N. & Sons, Brantford
Experimental Farm, Kapuskasing
Fairbairn, T. L., Billings Bridge
Fargo, Wm., Charlston
Fraser, T. S., Lancaster
Goodin, Thos. & Son, Spencerville
Grant, Angus, Moose Creek
Gullet, F. W. & Son, Welland
Hamill, H. C., Markham
Harper, A. T., Caledonia
Harris, John C., Mount Elgin
Henderson, A., Athens
House of Refuge, L'Orignal
Howes, F. A., Harold
Howey, C. M., Burford
Kilts, Geo. C., Perry Station
Leeming, Wellesley, Glanford Station
McDonough, J. T., Westover
McDonough, Miller, Westover
McFadden, Wm., Navan
McGregor, P. A., Russell
McNaughton, W. G., Martindown
MacPherson, Wilson & Son, St. Anne
Macoun, Chas., Campbellford
Montgomery, W. L., Gravel Hill
Osmond, C. S., Milton
Palmer, E., Burpee, Norwich
Palmer E. Burpee & Son, Norwich
Pearson, Geo. & Sons, Waterdown
Raison, Geo. H., Harlem
Raison, Levi, Soperton
Rennick, Geo. M., Vankleek Hill
Roy, Dan., Bainsville
Ryan, S. A., Riceville
Schweitzer, Amasa & Son, Bloomingdale
Schwoob, J. W., Welland Port
Shaver, Morley, Millgrove
Sorley, Jas. & Son, Ottawa
Stokes, G. H., Tweed
Tietz, E. F., Hagersville
Tummon, W. E., Cookston
Wood, H. M., Crookston

GUERNSEY

McSloy, J. A., St. Catharines

HOLSTEIN FRIESIAN

Allied Stock Farm, Wilsonville
Amy, Wm., Burford
Arbogast, Michael A., Sebringville
Arbogast, Peter S., Mitchell
Armstrong, John, Navan
Armstrong, John T., Hagersville
Bales, O. D., Lansing
Barnard, Geo. W., Norwich
Berry, John, Middleport
Bethune, Geo. H., Ryckman's Corners
Boake, H. F., Downsview
Bowman, R. J. & Sons, Hagersville
Bowyer, B. A., Simcoe
Brethen, G. A., Norwood
Brethour & Nephew, Burford
Burt, William, Philipsville
Carlisle, G. F., Newton Brook
Challand, L. W., Port Dover
Christie, Thos., Renton
Clark, A. Harold, Mountain
Clark, H. A., Brockville
Cohoe, Wm. J., Burgessville
Collver, Clayton S., Simcoe
Cornwell, A. E., Norwich
Cooper, Geo., Willowdale
Cowan, Jos., Silverdale
Crang, Jethro, Weston
Culp, S. A., Vineland
Culver, H. Y., Simcoe
Dean, H. H., Guelph
Deeks, J. D., Morrisburg
Dunseith, F. C., Stratford
Eaton Hall Farm, Eversley
Erwin, John, Waterford
Fallis, J. A., Jarvis
Fallis, W. J., Jarvis
Farrow, Frank, Waterford
Flatt, R., Hamilton
Goodfellow, Geo H., Lancaster
Grier, T. B., Lansdowne
Grier, W. W., Lansdowne
Griffin, F. J., Burgessville
Hamilton Health Assn., Hamilton
Hambly, W. E., Waterford
Hanmer, Clinton E., Norwich
Henning, John, Nanticoke
Hicks, R. F., Newtonbrook
Honey, J. S., Milliken
Hopkins Bros., Ottawa
Huffman, Henry, Hagersville
Hulet, A. E., Norwich
Hunter, Gordon, Niagara-on-the-Lake
Jackson, Jas., Norwich
Jackson, H. J., Norwich
Jakes, J. C., Merrickville
Jantzi, Christian, Gads Hill
Jeffrey, David, Simcoe
Jeffrey, Wm., Simcoe

Jenkins, Thos., Inglewood
Johnston, W. A., Navan
Kitchen, C. C., Simcoe
Kitchen, John C., Nanticoke
Laning, R. C., Waterford
Lawson, Ray, London
Leach, Jno. B., Verner
Lemon, Wilber, Lynden
Leng, Geo., Hagersville
Lindsay, W. D., Hagersville
Logan, J. S., Hamilton
McComb, G. R., Burgessville
McCullough, F. H. & Son, Navan
McFadden, Geo., Navan
McKay, M. J., Cornwall
McLaren, R., Waterford
McLeod, D. W., Dalkeith
McRae, Geo. A., Bainsville
Mallory, B., Belleville
Mason, Wallace H., Simcoe
Merritt, Robert & Son, Sillsville
Miell, H. J., Hagersville
Monteith, S. J., Stratford
Moore, Gordon, Caledonia
Moyer, Ira, Beamsville
Moynihan, John, Aurora
Munday, Mark M., Bowmanville
Nafziger, Moses, Milverton
Nanceckeville, W. W., Ingersoll
Nesbitt, E. W., Woodstock
Newman, Leonard, Merrickville
Oliver, Nelson, St. Mary's
Oliver, Robert S., St. Mary's
Ontario Hospital, Brockville
Ontario Hospital, Hamilton
Osler, E. F., Bronte
Parkinson, H. W., Hagersville
Parsons, John J., Jarvis
Phibbs, Ralph, Jarvis
Phillips, John J., Hagersville
Plant, Elsworth, Burford
Porter Bros., Thornhill
Purtelle, E. B., Bloomfield
Reilly, Jas., Shanley
Reilly, T. Carl, Shanley
Ricker, Frank, Attercliffe Station
Risebrough, R. J., Newton Brook
Robb, John A., Lynden
Ruby, Christian, Tavistock
Schuyler, Wesley, Simcoe
Slack, Arthur C., Delta
Smith, Carl, Jarvis
Snider, P. Stewart, Bainsville
Snowden, L. C., Bowmanville
Stainton, A. T., Hampton
Steckley, Nicholas, Wellesley
Stevens, Arch., Delta
Stevens, J. D., Bowmanville
Stevens, W. C., Delta
Stevens, R. R., Bowmanville
Stock & Son, Wm., Tavistock
Stewart, J. W., Lyn
Stuart, C. S., Waterford
Teasdale, Frank, Concord
Terryberry, Carl, Harley
Thomson, D. T., Cainsville
Tinkess, S. W., Avonmore
Tisdale, I. N., Norwich
Waldie, Alex., Stratford
Walker, G. H., Port Perry
Walker, W. F., Port Perry
Wallace, Jere, Spencerville
Watson, J. S., Woodbridge
Watson, W. E., Pine Grove
Webb, Robert, Seely's Bay
Wells, Durham, Morrisburg
Wettlaufer, L. L., Tavistock
Wilson, J. Frank, Hagersville
Wood, J. A., Merrickville
Youmans, Hayes, Waterford
Young, John, Brantford
Young, Wm., Ancaster

JERSEY

Bagg, Fred. J., Unionville
Bagg, Jas. & Sons, Edgeley
Berkley, P. O., Morrisburg
Brown Bros., Oak Ridge
Bruce, Dr. H. A., Eglinton
Bull, B. H. & Sons, Brampton
Chapman, Frances, Malton
Clark, Wm., Meyersburg
Cockshutt, H., Brantford
Decoe, J. S., Simcoe
Evans, W. Selby, Queensville
Fletcher, Carson (Mrs.), Hamon
Fraser, Jas. A., Prescott
Jackson, Geo., Downsview
Jarvis, Aemilius, Aurora
Johnson, E. A., L'Orignal
Kellum, B., Waterford
Landon, M., Simcoe
Langs, E. R., Langford Station
MacDonald, W. S., Gananoque
Moore, W. H., Rouge
Moote, Alfred & Son, St. Anne
Moote, Ivan L., St. Anne
Nesbitt, E. W., Woodstock
Papple Bros., Brantford
Snyder, A. U., Waterloo
Wood, Chas. F., Aurora
Yonson, T. E., Simcoe

SHORTHORN

Anderson, G. C., Waterford
Auld, A. Gordon, Guelph
Bingle, A., Grimsby
Brown, John, Jr., Harley
Carter, Geo. W., Ilderton
Clark, Lloyd W., Cayuga
Cockshutt, F. W., Brantford
Crone, Scott, Mt. Albert
Daw, Geo. & Son, Glanford Station
Dunnett, G. & W., Hagersville
Dunnett, W. S., Hagersville
Erwin, W. M., Waterford
Experimental Farm, Kapuskasing
Gibson, D. Z., Caledonia
Harper, W. Q., Hagersville

Harper, A. T., Caledonia
Harper, Robert, Caledonia
Hewitt, Harry A., York
Hewitt, Wm. E., York
Hill, G. H. & Sons, Norwich
Howell, A. E., Fenwick
Jackson, Geo., Downsview
Jackson, S. W., Woodstock
Kelsa, Robert A., Monteith
Knight, Edw., Vanessa
McAllister, Andrew, Glanford
McAllister, Jas. D., Glanford
McDonald, F. & Son, Woodstock
Martindale, Ross, Caledonia
Moore, W. H., Rouge
Nie, Emerson, Nanticoke
Plummer, Henry A., Monteith
Pringle, Jas., St. Marys
Robb, Jno A., Lynden
Scollard, Frank, Ennismore
Scott, Hugh A., Caledonia
Senn, J. F. & Son, Binbrook
Smith, Adam A., Hagersville
Walker, John, Nanticoke
Weld, Wm. C., London
Wood, E. R., Burlington

QUEBEC

ABERDEEN ANGUS

Sanders, M. H., Lennoxville

AYRSHIRE

Anderson, W. E., Howick
Beaudet, J. E., Thetford Mines
Beauregard, D., St. Hyacinthe
Beauregard, J. E., St. Damase
Bergeron, Antonio, Plessisville
Bergeron, Athanase, Ste. Sophie
Bergeron, Calixte, St. Pierre Baptiste
Black, David, Lachute
Black, J. H., Lachute
Bois, Louis J., St. Jean Port Joli
Bourdeau, Harvey, Ste. Clothilde
Boutet, Chas., Victoriaville
Brownlee, R. T., Hemmingford
Bryson, Jas. D., Allans Corners
Bryson, S., Brysonville
Budge, E. C., Beauharnois
Cairncross, J. B., Baie D'Urfe
Carignan, Emile, Gentilly
Caron, Jos. St. Gregoire
Cote, Romuald, L'Ange Gardien
Coulter, J. C., Huntingdon
Dennis, Armand, St. Cuthbert
Descoteaux, J. F., Ste. Monique de Nicolet
Dickson, P., Ormstown
Doig, Alex., Lachute
Doig, Andrew, Lachute
Dryden, Wilton E., Cowansville
Drysdale, Thos. E., Brysonville
Durocher, Ulric, Clairvaux
Dupuis, Wilfrid, St. Paul L'Ermite
Elder, Geo. D., Glenelm
Experimental Farm, Lennoxville
Finlayson, G., Ormstown
Fish & Son, A. E., Ayer's Cliff
Fournier, A. F., Montmagny
Fournier, Eugene G., Montmagny
Fournier, G. F., Montmagny
Hamilton, S. J., St. Eustache
Hastings, H. L., Sweetsburg
Hay, Wm., Lachute
Henderson, H. N., Huntingdon
Holmes, Robert O., Howick
Howden, R. M., St. Louis de Gonzague
Huot, Clodomir, St. Canute
Hyde, Chas. F., Huntingdon
Kay, W. F., Phillipsburg
Kettyle, T. Eddie, Lachute
Labelle, F., St. Jerome
Laurentide Co. Ltd., Talbotville
Laurin, Esaie, Lachute
Lees, Jas., Lachute
Legare, Arthur, Sans Bruit
Leishman & Son, Robert, Lachute
Logan, J. W., Howick
Loiselle, Ovide, St. Marc
Lussier, Arthur, Varennes
McAdam, Q. R., Lachute
McArthur, P. D., Howick
McDougall, Robert A., Ormstown
McKay, G. J., Hemmingford
McMillan, Gilbert, Huntingdon
McOuat, J. R., Ormstown
McOuat, Erskine, Brownsburg
Martin, A. R., Thetford Mines
Mosher, W. J. & Son, Noyan
Nesbit, Jas., Huntingdon
Pesant, Jos., Montebello
Pinard, Octave, Ste. Sophie
Proulx, J. E. F., St. Pierre de Montmagny
Proulx, Leopold, St. Ours
Rennie Bros., Huntingdon
Rivard, Donat, Clairvaux
Roberts, W. M., Ormstown
Rodger, Chas. R., Lachute
Rodger, David, Lachute
Rodger, Wm. J., Lachute
Ross, J. K. L., Montreal
St. Cyr, J. Omer, Nicolet
Smith, John A., Lachute
Smith, S. E., Lachute
Stewart, Norman O., Hemmingford
Sweet, F. A., Hemmingford
Tardif, Jos., St. Valere
Taylor, B. J., Ayer's Cliff
Thompson, Wm., Lachute
Thompson, W. D., Stanstead
Todd, Wm., Lachute
Tully, W. C., Athelstan
Vigneault, Gaspard, Ste. Sophie
Walker, G. M., Lachute
Wallace, Walter, Warden
Wilkins Bros., Farnham

BROWN SWISS

Libby, Ralph H., Stanstead

FRENCH CANADIAN

Bourdon, T. O., Chateauguay
Experimental Farm, Cap Rouge
Experimental Farm, La Ferme
Fleurant, W., Ste. Monique
Fowler, H. W. & O. A., Kingsbury
Grandpre, Domina, St. Liboire
Pitre, J. E., Chateauguay
St. Hyacinthe Dairy School, St. Hyacinthe
Van Bruyssell, Ferd., Beaupre

GUERNSEY

Carter, Arthur C., Knowlton
Fisher, R. Eric, Bolton Centre

HOLSTEIN-FRIESIAN

Alexander, J. J., St. Louis de Gonzague
Auclair, Chas., Marieville
Beauregard, Rodrique, St. Damase
Boa & Sons, Lachute
Boyce, E. C., Athelstan
Brown, D. H., Glenelm
Burrill Bros., Gore
Cairncross, J. B., Baie D'Urfe
Collum & Son, Chas., Ormstown
Coulter, W. T., Huntingdon
Cowan, David, Ormstown
Dobbie, Robert, Calumet
Dunn, R. S., Ormstown
Elder, A. W., Glenelm
Elder, Geo. P., Huntingdon
Elder, P. M., Glenelm
Fletcher, E. G., Richmond
Houle, G. E., Nicolet
Ingham, B. S., Lennoxville
Johnson, F. W., Foster
Kerr, Robert T., Howick
Lamy, Pierre, Nicolet
Leblanc, Romeo, Victoriaville
McAdam, Garrison, St. Canute
McMullen, Wallace, Ormstown
McNaughton, A. W., Huntingdon
McNaughton, M. M., Huntingdon
McRae, John, Howick
Marcoux, Elzear, Lennoxville
Menard, J R., Ste. Justine de Newton
Parker, L. H., Stanstead
Raymond, D., Vaudreuil
Rutherford, Andrew, Brysonville
Sangster, N., Ormstown
Stark, Peter, Huntingdon
Tannahill, John J., Huntingdon
Thompson, W. D., Stanstead
Todd, Chas. R., Huntingdon
Whelan, T. J., Huntingdon
White, A. A., Huntingdon

JERSEY

Aldrich, Edwin A., Lennoxville
Bishop, F. J., Coaticook
Collyer, Alfred, Foster
Davidson, W. S., North Hatley
Edwards, Chas. O., Hillhurst
Ford, G. E., Cowansville
Frank, R. W., Kingsbury
Gale, F. G., Waterville
Geddes, H. W., Way's Mills
Hamilton, J. J., Massawippi
Harkness, Eliza, Bulwer
Holden, E. de F., Frelighsburg
Huot, Irenee, St. Canute
Ingalls, G. H., Abercorn
Lowry, H. E., Sawyerville
McKay, A., Upper Melbourne
Mayhew, Reg. A., Dixville
Norcross, J. W., Foster
Perry, E. W., Ayer's Cliff
Richmond Jerseys Inc., Richmond
Ruiter, Chas. & Sons, Cowansville
Taber, P. W., East Farnham
Thornton, J. L., Coaticook
Wilson, William, Lachute
Young, C. L., Clarenceville

SHORTHORN

MacLaren, Alex., Buckingham
Maxwell, Edward, Baie D'Urfe
Owens, W. T., Montebello
Ritchie, Jas. & Son, Dewitville
Todd, W. S., Ormstown

MANITOBA

ABERDEEN ANGUS

Boughen, A. J., Dauphin
Delgatty, Geo., Gilbert Plains
Garnett, W. F., Carman
Hume, J. R., Souris
Kerr, W. & Son, Virden
Leader, Harry, Burnside
Manitoba Agr. College, Winnipeg
McCullough, R. M., Portage la Prairie
Patterson, Peter, Rosebank
Robinson, J. B., Belmont
Turner, H. G., Wellwood
Turner, Jas., Caroll
Ward, W. J. & Birss, A. A., Dauphin

AYRSHIRE

Dutton, John R., Gilbert Plains
Experimental Farm, Morden
Manitoba Agr. College, Winnipeg

HEREFORD

Dutton, John R., Gilbert Plains
Manitoba Agr. College, Winnipeg
Robison, H. E., Carman

HOLSTEIN-FRIESIAN

Averill, Alfred, Clan William
Hepburn, W. J. L., Virden
Huard, J. A., Otterburne
Johnston, Alex., Balmoral
Layng, J. H., Brookdale
Manitoba Agr. College, Winnipeg
Morland, J. & M. J., Crystal City
Patterson, Peter, Rosebank
Wieneke, F. H., Stony Mountain

JERSEY

Edward, W. V., Souris

POLLED ANGUS

McLeod, R. A. & A. C., MacDonald

SHORTHORN

Agnew, D. W., Douglas
Allison, Andrew, Roland
Allison, Geo., Burnbank
Berry, J. J., Gilbert Plains
Blair, L. I., Ochre River
Clay, John H., Gilbert Plains
Craig, Geo., Brookdale
Dalgleish, R. J., Grandview
Davidson, Geo. W., Lidstone
Dracas, F. J., Carman
Drought, J. H., Millwood
Experimental Farm, Brandon
Fraser, T. B., Swan River
Frazer Bros., Beulah
Garbutt, John H., Rapid City
Gordon, Geo., Oak Lake
Gorrell Bros., Pilot Mound
Graham, P. E., Pomeroy
Gray, Geo. & Son, Graysville
Grayston, Wm., Newdale
Jamieson, Edwin, McAuley
Langill, David, Giroux
Killoh, John, Hamiota
Manitoba Agr. College, Winnipeg
McDonald, J., Purvis
McGregor, D., Carman
Matheson, J. P., Kenville
Menzies, Alex., Shoal Lake
Murray, W. S., Carman
Naisbit, B., Rapid City
Orr, Angus, Carman
Oxby, F. W., Somerset
Price, A. W., Gilbert Plains
Rankin, G. & Son, Oakner
Robertson, R. T., Snowflake
Sanders, Jno., Snowflake
Sanders, W. J., Killarney
Stewart, D., Gilbert Plains
Strachan, John, Pope
Tolton, H. R., Oak Lake
Tulloch, Jas., Graysville
Turner, E. R., Gilbert Plains
Underhill, Geo. H., Moline
White, W. C., Darlingford
Wilkin, L. C., Kane

SASKATCHEWAN

ABERDEEN ANGUS

Bayne, Ansley G., Tuxford
Lee, F. M. & Sons, Marchwell
Lyon, W. D., Deveron
McLaren, W. R., Shellbrook
Richardson, E. P. (Estate), Grenfell
Sim, John, Grenfell
Teece, H., Lemberg
University of Saskatchewan, Saskatoon

AYRSHIRE

Lee, F. M. & Sons, Marchwell
Thomas, C. E. & Son, Lloydminster
University of Saskatchewan, Saskatoon

GUERNSEY

Clausing, Mrs. F. F., Leipzig

HEREFORD

Reid, T. F. C., Moosomin
University of Saskatchewan, Saskatoon

HOLSTEIN-FRIESIAN

Acres, F. L., Qu'Appelle
Experimental Farm, Rosthern
Murray, A. H., Rosthern
University of Saskatchewan, Saskatoon

SHORTHORN

Bergsteinson, H., Alameda
Brant, John, Edenwold
Colquhoun, Chas. S., Maple Creek
Cumming, E., Kipling
Experimental Farm, Indian Head
Hume, E. K., Manor
Jopp, V. W., Rocanville
King, T. W., Regina
McLaughlin, W. J. & Sons, Kamsack
Minor, H. J., Earl Grey
Richardson, E. F., Semans
Murray, A. H., Rosthern
Robson, H. C., Balcarres
Rosom, Harry, Davin
Ross & Holyoak, Indian Head
University of Saskatchewan, Saskatoon
Watson, A. J. & Sons, Oxbow
Watson, Hugh C., Oxbow

ALBERTA

ABERDEEN ANGUS

Henderson, Thos. & Son, Lacombe
Vauxhall Stock Farm, Vauxhall

AYRSHIRE

Black, Alex. D., Airdrie
Heartwell, W. L., Sibbald
Ness, Rowland, De Winton

HEREFORD

Hunter, G. E. & W. A., Calgary

HOLSTEIN-FRIESIAN

Gilbert, Wm., Stony Plain
Hays & Co. Ltd., Carstairs
Laycock, J. H., Okotoks
Richardson, W. G., Nanton
Vauxhall Stock Farm, Vauxhall

SHORTHORN

Allonby, G. K., Crossfield
Allyn, Wm. M., Morinville
Atcheson, J. W., Cayley
Beck, Jacob, & Sons, Ponoka
Hutton, G. H., Lacombe
McDonell, Angus, St. Albert
Sharp, W. W., Stettler
Watson, Thos., Stettler

BRITISH COLUMBIA

AYRSHIRE

Murray, John, Chilliwack
Robson, F., Mayne Island
Shannon Bros., Cloverdale
University of British Columbia, Vancouver
Vanderhoop, J. P., Pemberton Meadow

HOLSTEIN-FRIESIAN

Blackburn, Esther M., Ganges
Buckland, C. C., Sullivan
Experimental Farm, Agassiz
Forde, L. O., Francois Lake
Gowen, Hammond, North Bend
Hoffman, L., Aldergrove
Matthew, A. & S., Westholme
Solly, L. F., Westholme
University of British Columbia, Vancouver

JERSEY

Barton, David, Chilliwack
Bevan, H. W., Duncan
Bulloch, H. W., Ganges
Collyer, A. E., Chemainus
Experimental Farm, Sidney
Grimmer Bros., Port Washington
Matthew, A. & S., Westholme
McLennan, R. P., Vancouver
Matson, J. S. H., North Saanich
Menzies, A. H. & Son, Pender Island
Nelson, J. H. H., Barriere
Solly, L. F., Westholme
Tolmie, S. F., Victoria
University of British Columbia, Vancouver
Willett, Wilfred A., Duncan

SHORTHORN

University of British Columbia, Vancouver

THE CANADIAN HORTICULTURAL COUNCIL

A CIRCULAR setting forth the accomplishments, and indicating the nature of the work being carried on by the Canadian Horticultural Council has recently been issued by the Secretary-Treasurer, Mr. L. F. Burrows, Ottawa, from which the following is an excerpt:—

1. The confidence of the various departments of the Dominion Government has been secured and the Council is now recognized as the official mouthpiece of the organized horticulturists both professional and amateur in Canada.

2. A plant registration bureau, having for its object the protection of plant breeders, has been established and is now actively functioning.

3. Numerous questions concerning the sales tax as affecting the horticultural and allied interests have been taken up with the proper officials and satisfactory adjustments secured.

4. Upon the request of the Council the Department of Agriculture has this year undertaken extensive experiments in the dehydration of fruits and vegetables and has commenced a thorough investigation of the breakdown of certain varieties of apples in British Columbia due to which the fruit growers were suffering severe losses.

5. An extensive publicity campaign has been carried on—over two hundred articles covering various horticultural subjects, having been submitted to and accepted by the newspapers and periodicals of Canada.

6. Upon representation by the Council the law concerning the manufacture and sale of soft drinks, particularly those represented as containing fruit juices, is being more vigorously enforced.

7. Certain clauses in the proposed amendments to the Insect and Pest Act unsatisfactory to the nurserymen and florists were, after a conference, satisfactorily adjusted.

8. Dominion Incorporation was secured for two of the associations having representatives upon the Council.

9. The Council has the assurance of the Department of Agriculture that legislation will be prepared looking to the regulation of the sale of insecticides and fungicides.

10. Through the generosity of Mr. J. E. Carter, Guelph, Ontario, the Council has arranged to present annually, a gold medal having an intrinsic value of One Hundred Dollars, known as the " Carter Medal " to the person who, in the opinion of the Council, had done the most for the advancement of Horticulture in Canada during the year preceding the annual meeting.

11. Continuous pressure has been exerted in numerous directions for a removal of the embargo on Canadian apples, maintained by Australia and Japan.

12. Trial plots containing large numbers of varieties of vegetables and flowers have been established at different centres in order that the true variety names may be established and the lists of varieties offered for sale clarified.

The Council is completing arrangements for:—

(1) A national apple day and national apple week.

(2) A national decoration day.

(3) A national arbor day.

(4) Certification of nursery stock.

(5) A vegetable advertising campaign.

(6) A standard score card for horticultural products, for the use of judges at shows and exhibitions throughout Canada.

The Council is now representative of approximately 85,000 people, and consequently the matters brought to its attention are numerous and varied. It is pointed out, however, that the Council was organized and is maintained entirely by horticulturists, to give service to the horticulturists of Canada on any questions that they may see fit to place before it.

VEGETABLE VITAMINS

By L. F. BURROWS, Secretary, Canadian Horticultural Council

COMPARATIVELY recent is the addition of the word "Vitamin" to our vocabulary, and even though the use of the word is now common, its meaning is not yet understood. Physicians have long recognized the value of vegetables in the daily diet and we are now told that this value lies largely in the fact that they contain vitamins, and that vitamins are necessary to life. Some vegetables contain greater quantities and of different kinds than others. Three distinct kinds of vitamins have been made "A", "B" and "C".

Vitamin "A" is a mysterious element in food, without which children cannot grow, but which grown folks also need. Shortage of vitamin "A" leads to disease of the eye, skin, and kidneys; and it may cause bad teeth, diarrhoea, pellagra, and other ailments. As a rule, seeds of all kinds are rather deficient in vitamin "A", although green peas contain appreciable amounts. Leafy plants, on the other hand, are valuable foods in this regard. Spinach and chard are probably the richest of the common leafy foods in this element, lettuce ranks next, with cabbage holding third place.

The roots and tubers vary, sweet potatoes and carrots ranking first, while white or Irish potatoes contain but a small amount, and it is doubtful if beets, rutabagas and parsnips contain appreciable amounts. Tomatoes, however, are very rich in vitamin "A" and Hubbard squash is also a valuable source. Little work has been done on the fruits but there is evidence that apples, bananas and oranges contain small amounts of this vitamin.

Vitamin "B" is guardian of good digestion and proper functioning of the liver and other glands. This vitamin is found in the germ and branny portion of cereals. In the milling of wheat, however, this vitamin is so completely removed that the best grades of flour are entirely lacking. This does not mean that we should condemn the white breads, starchy foods, white rice, etc.; it merely means that we must choose our foods intelligently and eat more vegetables.

Potatoes, sweet and white, contain appreciable amounts of vitamin "B", although the turnip and onion are more valuable in this regard. The beet root contains a fair amount although its leaves appear to be much richer. This vitamin is also found in the tomato, cabbage, spinach, lettuce, parsley, and the lowly dandelion, the tomato being especially valuable.

While many fruits have not been studied, it is probably safe to state that most fruit juices contain appreciable amounts of vitamin "B". It is likewise probably true that nuts are valuable sources of this vitamin, inasmuch as all nuts that have been studied contain appreciable amounts.

Vitamin "C" prevents disease and promotes the general health. Lack of it gives the skin a bad colour and makes the heart weak. It has long been known that lemons, limes, oranges, and fresh fruits are curative in scurvy. It has only been in recent years that we have understood that this curative effect was due to vitamin "C". While oranges have been used for a number of years in the treatment of infantile scurvy, it is only recently that it has become the common practice to supply orange juice to infants as part of the regular feeding practice. More recently it has been discovered that tomato juice is practically equal to the juice of the orange in this regard, and many physicians in the poorer districts of

the large cities are prescribing strained tomato juice in place of orange juice. The juice of canned tomatoes seems to be very satisfactory for this purpose, indicating that the canning process is not particularly destructive as far as vitamin " C " is concerned. Berries are known to have scurvy-curing properties, although little investigational work has been done.

The Swedish turnip or rutabaga is very valuable as a source of vitamin "C" and the same is true of the carrot. Young carrots are apparently more valuable than old carrots and this appears to be true for many vegetables. As a rule, it is probably safe to state that the vitamin content of vegetables is highest at the time that the vegetable is most prized from the standpoint of tenderness and taste. Potatoes, onions and parsnips are also considered valuable antiscorbutic foods. Rhubarb, lettuce and cauliflower must also be included in the list, while lovers of cabbage salad and " slaw " will be glad to know that raw cabbage is one of the best sources of vitamin " C " that we have. Tomatoes have the three kinds of vitamins necessary to human health. Most vegetables have one or two but seldom all three.

It is probably best to eat our fruits and vegetables in the fresh form when it is possible to do so. There is little, however, to be feared from the usual methods of canning and cooking. If we eat a sufficient amount of vegetables and fruits throughout the year, it will not matter if a small percentage of the vitamins are destroyed in the cooking process. As a rule, long continued heating or cooking is considered undesirable, and air should be excluded as far as possible.

It is not necessary that we be vegetarians. We should be reasonable and sensible and not faddists. Every diet, especially that of growing children, should contain milk, butter, eggs, fresh vegetables, and fresh fruits if we expect to obtain the best results.

Various fruit and vegetable canning recipe books have been issued from time to time, but the best that has recently come to my attention is that issued by the Fruit Branch of the Dominion Department of Agriculture. These booklets contain recipes which have been thoroughly tested, are practical and economical. They may be had free upon request.

NEW PLANT ORIGINATIONS PROTECTED

THE Canadian Horticultural Council, with headquarters at Ottawa, is now prepared to record new varieties of plants of Canadian origin. To this end a Plant Registration Bureau has been organized as a subdivision of the Council, which will have charge of the details of the work. This will include the recording of the name and description of the variety, the name of the originator or distributor, and the testing of the variety to determine its suitability for registration. This, it is believed, will tend to safeguard the rights of plant originators and introducers.

Mr. W. T. Macoun, Dominion Horticulturist, is Chairman of the Plant Registration Bureau of the Council and the following are Provincial representatives:—

British Columbia—Prof. F. E. Buck, University of B.C., Vancouver, B.C.

Alberta—W. H. Fairfield, Supt. Dominion Experimental Farm, Lethbridge, Alta.

Saskatchewan—Dr. Patterson, University of Saskatchewan, Saskatoon, Sask.

Manitoba—Prof. F. Brodrick, Agricultural College, Winnipeg, Man.

Ontario—J. H. Moore, Islington, Ont.

Quebec—Prof. T. G. Bunting, Macdonald College, Que.

Prince Edward Island—J. A. Clark, Supt. Dom. Experimental Farm, Charlottetown, P.E.I.

New Brunswick—A. G. Turney, Provincial Horticulturist, Fredericton, N.B.

Nova Scotia—W. S. Blair, Supt. Dom. Experimental Farm, Kentville, N.S.

Yukon—Jas. Farr, Swede Creek, Dawson.

Further information and application forms may be had from any of the above or from the Secretary of the Canadian Horticultural Council, 21 Cliff St., Ottawa.

LIVE STOCK EXPORTS

IN the first six months of 1923, Canada exported to Great Britain, according to Dominion Department of Agriculture, 30,029 cattle against 4,185 in the same period last year, and 5,108,500 pounds of beef against 2,703,600 pounds; 50,460,600 pounds of bacon against 46,127,500 pounds; 1, 428,700 pounds of pork against 155,900 pounds, and 29,500 pounds of mutton against 34,100 pounds. To the United States in the same period, the exports were 23,659 cattle compared with 12,795 last year; 9,208 calves compared with 5,900; 3,707 sheep, compared with 18,075; 2,979,000 pounds of beef, compared with 5,923,400 pounds; 83,200 pounds of bacon, compared with 108,400 pounds; 375,200 pounds of pork, compared with 384,200 pounds, and 60,200 pounds of mutton, compared with 1,198,400 pounds. It will be noticed that exports to Britain considerably increased and that exports to the United States greatly decreased. On the whole Canada's export trade in live stock and live stock products has been better this year than last, the totals for the six months ended June 30 last showing an increase of 35,696 cattle, of 3,305 calves, of 1,219,100 pounds of beef, of 4,473,200 pounds of bacon, and of 1,308,700 pounds of pork. The only decreases were 14,258 sheep and 1,173,100 pounds of mutton, both due to the falling off in exports to the United States.

FLAX EXPERIMENTS

SINCE the acquisition of property in the township of Clinton, Lincoln County, Ontario, the work of the Division of Economic Fibre Production of the Dominion Experimental Farms, has been considerably extended. It had previously been felt that an addition to the mill at Ottawa was required in order to effectively carry on the operations of the Division, and when the scutch mill at Ottawa was destroyed by fire in 1920, the need became imperative. As a consequence, in the spring of 1921, a flax mill at Clinton, Ont., was leased for two years with the option of purchase at the end of that period. A hundred and eighty-five acres of land in the vicinity was rented at the same time. At Ottawa the mill was designed more for deseeding, retting and

scutching the material grown on small experimental plots, but in Clinton township, experiments on a larger scale and demonstrations with new types of machinery likely to prove useful in reducing the cost of production are made possible. The work that has been carried on in this direction during the past two years is fully described in the report of the Chief Officer of the Division covering 1921 and 1922, just published at Ottawa, which will be found to contain much informative matter of value to the flax grower in any part of the country. Not only at Ottawa and Clinton, but at Branch Farms or Stations in Prince Edward Island, New Brunswick, Nova Scotia, Quebec, Northern Ontario, Alberta, and British Columbia, varieties are being tested for yield, for fibre and for seed. So far, the flax grown at the Experimental Station at Nappan, Nova Scotia, has been productive of the highest yields, with Charlottetown, P.E.I., second along with Kapuskasing, followed by British Columbia and Alberta.

THE CANADIAN COLONIZATION ASSOCIATION'S LAND LISTS

THE Canadian Colonization Association has issued a booklet for each of the Prairie Provinces giving a list of land for sale by private owners. In the aggregate the listings total over a million acres and comprise some 12,000 parcels of land. Prospective purchasers will be furnished with an independent report without charge. In many instances the terms of payment are amortized on the 32 year basis, with no payment for two years after the first, and the balance in thirty annual instalments. The interest rate is six per cent. Comparatively few of the farms are equipped, and as a rule the improvements in the way of buildings, etc., are slight, if any. The lands listed are reasonably accessible to the railway.

CANADIAN VETERINARY MEDICAL ASSOCIATION

THE decision was reached by the Canadian delegates in attendance at the annual convention of the American Veterinary Association held in Montreal in August, 1923, to form a Canadian Veterinary Medical Association. A committee, with Dr. F. Torrance of Ottawa as chairman, was appointed to draft a constitution and to take in hand all matters relating to organization. The committee, which comprises one representative from each province, is as follows: Quebec, Dr. F. T. Daubigny; Ontario, Dr. C. D. McGilvray; Nova Scotia, Dr. Geo. Townsend; New Brunswick, Dr. McLean; Prince Edward Island, Dr. J. A. Allen; Manitoba, Dr. J. B. Still; Alberta, Dr. J. C. Hargrave; Saskatchewan, Dr. Barker; British Columbia, Dr. W. H. MacKenzie.

BUTTER SUBSTITUTES EXCLUDED

OLEOMARGARINE may no longer be imported into Canada, nor is its manufacture in this country permissible. This prohibition came into effect on the first of September, but dealers are given until the end of February, 1924, to dispose of their stock, after which the sale will no longer be legal. The restrictions as to oleomargarine existed in Canada for many years previous to the war. They were removed as a war measure, and their restoration was looked upon by Parliament as being in the best interest of the public.

The product known as renovated butter is also excluded by an amendment to the Dairy Produce Act passed at the 1922-23 session, which likewise shuts out filled milk, filled cream, or filled butter. These articles, which bulk large in the produce trade in the United States, contain fats other than the fat of milk. They have never occupied an important place in Canadian trade and their exclusion will not necessitate any marked readjustment of the dairy produce business.

QUARANTINE AND INSPECTION OF FOXES ENTERING PRINCE EDWARD ISLAND

UNDER and by virtue of the authority conferred upon me by the provisions of the Order in Council of November 30, 1909, containing regulations relating to Animals' Quarantine, I do hereby authorize and direct the inspection by veterinary inspectors of all foxes entering the Province of Prince Edward Island.

Consignors and consignees of foxes brought into said Island shall, on or before the arrival of said foxes in said Island, report the number and description of the same to the nearest Customs officer, and shall submit the same for veterinary inspection at Charlottetown.

The Order of June twenty-second, nineteen hundred and fifteen is hereby rescinded.

Dated at Ottawa, this tenth day of September, nineteen hundred and twenty-three.

(Sgd.) J. H. GRISDALE,
Deputy Minister of Agriculture.

INFORMATION ABOUT CANADA

THE Natural Resources Intelligence Service at Ottawa is a Branch of the Department of the Interior of the Dominion Government maintained to supply information regarding the natural resources of Canada.

Its aim is to centralize and act as a clearing house for information gathered from numerous sources, private as well as governmental.

Inquiries from intending settlers, business men, investors and others interested in Canada, addressed to the Superintendent will be promptly and cheerfully answered.

NEWS ITEMS AND NOTES

The total number of fur farms in Canada in 1922 was 1,009 comprising 960 fox farms, 17 raccoon, 13 mink, 3 skunk, 1 marten, 1 fisher, 4 karakul sheep, 5 beaver, and 5 muskrat farms. Compared with 1921, an increase of 185 is shown in the number of fox farms, and of 12 in the number of miscellaneous fur-bearing animal farms.

The total number of all kinds of fur-bearing animals on fur farms in Canada at the end of 1922 was 29,870, and the total value $5,570,988, compared with 23,105 and $5,977,545 in 1921. The decrease in total value is due to the lower values shown for silver foxes. For the whole of Canada the average value of silver foxes in 1922 was $250, while for 1921 the average was $322. The number of silver foxes on the farms at the end of the year 1922 showed an increase over 1921 of 3,479 or 18 per cent.

The value of the pelts sold from fur farms in 1922 was $549,464. The large item in the production was silver fox, which, being more valuable as well as more tractable, is most successfully bred.

Furs, dressed and undressed, to the value of $14,836,350, were exported from Canada in the fiscal year 1922, the British market absorbing $4,266,688 worth and the United States most of the rest. Canadian manufactures of furs and the home consumption are annually increasing with the growth of wealth and population.

At the close of the war Montreal took a position as an international fur market, holding the first Canadian fur auction sales in 1920, when 949,565 pelts, valued at $5,057,114, were disposed of. Auction sales have also been held at Winnipeg and Edmonton. The Canadian fur market is now firmly established and sales are held two and three times a year.

In 1920 the Dominion Bureau of Statistics commenced the annual collection of returns from fur traders. According to this source, the total fur production of Canada in 1920-21 was valued at $10,151,594, and for 1921-22 at $17,438,867.

"The Saskatchewan Rural Education Association continues to hold the premier place as the most successful and efficient organization for promoting and conducting junior community activities. During the year 1922, Rural Education Associations were responsible for over 60 per cent of the school exhibitions actually held and for over 72 per cent of the Boys' and Girls' Clubs in operation."—F. W. Bates, Director of School Agriculture for Saskatchewan.

At the fifteenth annual meeting of The American Association of Instructors and Investigators in Poultry Husbandry, held at the Central Experimental Farm, Ottawa, Mr. F. C. Elford, Dominion Poultry Commissioner, was elected President for the ensuing year.

Last season nearly four hundred poultrymen asked for the assistance of the Extension Poultry Culling Service of the University of Saskatchewan in culling their flocks, with the result that the inspectors handled and judged, both for egg production and for standard breed characteristics, more than twenty-five thousand fowls.

The Second World Poultry Congress and Exhibition will be held in Barcelona, Spain, from May 10 to May 28, 1924.

The Dominion Entomological Branch supplies the following particulars respecting the new plant inspection and fumigation building at Vancouver, B.C., made necessary by recent regulations under the Destructive Insect and Pest Act. The station is of hollow tile construction, covered with cement, and measures fifty by one hundred feet. It contains four fumigation chambers and, in addition, the large inspection and packing rooms are so constructed that they can readily be used for fumigating grain and other products. Three hundred and fifty tons of grain can be treated at one time.

According to the figures compiled by the Dominion Bureau of Statistics, the apple production of the Dominion is given, by provinces, for 1922, as follows:—Nova Scotia 1,981,000 barrels; British Columbia, 1,000,000; Ontario, 809,000; Quebec 112,000 and New Brunswick 25,000. The total production is placed at 3,838,000 as compared with 4,046,000 in 1921.

In the first seven months of the present year, Great Britain imported 3,274,145 hundredweights of butter, of which Canada supplied 254 hundredweights, and 1,599,703 hundredweights of cheese, of which Canada furnished 201,236 hundredweights and New Zealand 1,110,256 hundredweights. Canada was second as the exporter of cheese to the Mother Country but tenth in the supply of butter.

S. A. Bedford, L.L.D., whose retirement from the public service in the Province of Manitoba was announced recently, has been identified with the agriculture of Western Canada for over forty years, having been one of Manitoba's pioneer settlers. For eighteen years (1888-1906) Dr. Bedford was Superintendent of the Dominion Experimental Farm at Brandon, Manitoba. His association with the Experimental Farms Branch of the Dominion Department of Agriculture dates from 1887, in which year he aided Dr. William Saunders in selecting the sites of the Farms at Brandon, Man., Indian Head, Sask., and Agassiz, B.C.

In 1908, he was appointed Professor of Field Husbandry at the Manitoba Agricultural College, and in 1912 became Deputy Minister of Agriculture for the Province. After filling the latter post for over three years, he became Chairman of the provincial Weeds Commission, which position he occupied until his retirement.

Forest fires in the Province of New Brunswick are reported to have caused greater destruction in 1923 than at any time since the noted Miramichi fire in 1825. The area where the most serious damage occurred was in the vicinity of Five Fingers, but the Tobique and Nipisiquit River sections also suffered heavy timber losses. Several districts that had escaped the Spruce Budworm injury were burned over. The commercial loss from this season's fires has been tentatively figured at $12,000,000.

APPOINTMENTS AND STAFF CHANGES

The appointment is announced of Mr. W. A. Wilson, of Regina, Saskatchewan, as Agricultural Produce Marketing Agent in Great Britain, to take effect from September 16, 1923.

In the opinion of the Department of Agriculture the importance of the British market as a trade outlet for Canadian agricultural produce and the present trade situation in regard to Canadian dairy and meat products in particular, require the appointment of a fully qualified officer to represent the Department of Agriculture in Great Britain and to devote his full time to the study of market conditions in that country, and to the encouragement of the development in Great Britain, and to a less extent in Continental countries, of trade in the produce of Canadian farms and dairies. The present appointment is of a temporary nature, although the position will be a permanent one.

Dr. F. C. Craighead has resigned the position of Entomologist in the Forest Insect Division of the Entomological Branch of the Dominion Department of Agriculture to accept an appointment as Chief of the Division of Forest Insects in the Bureau of Entomology at Washington.

Frederick Torrance, B.A., D.V.S., Veterinary Director General for the Dominion of Canada, is retiring from the Civil Service under the provisions of the Calder Act. Dr. Torrance was appointed in December, 1912, to succeed the late Dr. J. G. Rutherford as head of the Health of Animals Branch, on the appointment of the latter to the Board of Railway Commissioners for Canada. Dr. Torrance's retirement dates from December 1, 1923.

A beginning has been made in the organization of a Division of Dairy Research in the Dominion Dairy and Cold Storage Branch by the appointment of Egerton G. Hood, B.S.A., Ph.D., to the position of Chief of the Division. Dr. Hood at present fills the position of lecturer in bacteriology at Macdonald College. He is a graduate of the Ontario Agricultural College and the Massachusetts Agricultural College at Amherst where he specialized in chemistry and bacteriology.

Mr. M. A. MacLeod, Superintendent of Agricultural Societies of the Province of New Brunswick, will assume the duties of principal of the new provincial Agricultural School which has been established at the Dominion Experimental Farm, three miles from Fredericton. Mr. MacLeod will continue to act as superintendent of Agricultural Societies and as editor of *The Maritime Farmer*, a post he has filled for the past eighteen years.

The Manitoba Agricultural College announces the appointment of F. B. Hutt, B.S.A., a graduate of the Ontario Agricultural College, to the position of lecturer in the poultry department.

ASSOCIATIONS AND SOCIETIES

Canadian National Veterinary Association.—This association was formed in September, 1923, with the object of uniting the veterinarians of Canada in the interests of the profession and to promote research. The following are the officers:—

President, Dr. F. Torrance, Ottawa; Vice-president, Dr. F. T. Daubigny, Montreal; Directors, Dr. C. G. McGilvray, Guelph; Dr. J. C. Hargrave, Medicine Hat; Dr. J. A. Allen, Charlottetown, P.E.I.; Dr. M. Barker, Regina; Dr. A. T. McLean, Moncton, N.B.; Dr. J. B. Still, Winnipeg; Dr. Geo. Tornsend, New Glasgow, N.S.; Dr. D. W. McKenzie, Vancouver; Treasurer, Dr. G. A. Dauth, Coteau-du-lac, Quebec; Secretary, Dr. J. H. Villeneuve, 200 West Dorchester St., Montreal.

Ontario Silver Fox Breeders' Association.—President, O. B. Koenig; Vice-president, W. H. Ruthven, Alliston; Secretary-Treasurer, F. B. Utley, Toronto.

Saskatchewan Beekeepers' Association.—President, J. Hubbard, Grenfell; Vice-President, T. H. Mack, Lumsden; Secretary-Treasurer, Dr. S. A. Merkeley, Moose Jaw.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Experimental Farm, Agassiz, B.C., 1922.—Report of the Superintendent, W. H. Hicks, B.S.A., Dominion Experimental Farms.

Experimental Station, Rosthern, Sask., 1922. Report of the Superintendent, W. A. Munro, B.A., B.S.A. Dominion Experimental Farms.

Experimental Station, Sidney, B.C., 1922.—Report of the Superintendent, F. M. Straight, B.S.A. Dominion Experimental Farms.

Experimental Station, Summerland, B.C., 1922.—Report of the Superintendent, R.H. Helmer. Dominion Experimental Farms.

Experimental Station, Kapuskasing, Ont., 1922.—Report of the Superintendent, Smith Ballantyne.

Division of Forage Plants.—Report for the year 1922. G. P. McRostie, Ph.D., Dominion Agrostologist. Dominion Experimental Farms.

Division of Field Husbandry, 1922.—Report of the Dominion Field Husbandman, E. S. Hopkins, B.S.A., M.S. Dominion Experimental Farms.

Division of Economic Fibre Production, 1921 and 1922.—Report of the Chief Officer, R. J. Hutchinson. Dominion Experimental Farms.

Destructive Insect and Pest Act.—Regulations thereunder. Acts, Orders and Regulations No. 8.

Rabbits.—By George Robertson, Assistant Dominion Poultry Husbandman and W. W. Lee, Poultry Husbandman. Bulletin No. 28—New Series. Poultry Division. Dominion Experimental Farms.

Dairying in New Zealand and Australia.—By J. A. Ruddick, Dairy and Cold Storage Commissioner. Bulletin No.34—New Series.

Fruit and Vegetable Recipes.—By Miss Ethel A. Preston. Circular No. 17. Fruit Branch.

Size and Colour Minimums for Apples.—Fruit Branch Circular No. 16.

ONTARIO

Report of the Minister of Agriculture for the Province of Ontario, 1921-22.

Beekeepers' Association of the Province of Ontario, 1922.—Forty-third Annual Report.

Care of Farm Implements and Tools.—Bulletin 300. Ontario Agricultural College. By Lionel Stevenson, B.S.A., M.S., Director of Extension.

Breeding, Growing and Finishing "The Bacon Hog."—Bulletin No. 299. Ontario Agricultural College. By Wade Toole, B. S.A., M.S., and R. G. Knox, B.S.A. Department of Animal Husbandry.

QUEBEC

Quebec Society for the Protection of Plants, 1922-23.—Fifteenth Annual Report. Supplement to the report of the Minister of Agriculture.

SASKATCHEWAN

Co-operation and Markets.—Ninth Annual Report of the Commissioner for the year ended April 30, 1923.

Agricultural Co-operative Associations of Saskatchewan.—Official Report of Conference, 1923. Co-operation and Markets Branch.

Co-operative Livestock Shipping.—Bulletin No. 74, Co-operation and Markets Branch.

Agricultural Extension.—Thirteenth Annual Report of the Director on the work of the Agricultural Societies of Saskatchewan during the twelve months ended April 30, 1923.

Rainfall Records for Saskatchewan.—Contributed by the Department of Field Husbandry, Agricultural Extension Bulletin No. 18. College of Agriculture, University of Saskatchewan.

Blackleg.—Its Nature, Symptoms and Prevention. Revised by J. G. Robertson, B.S.A., Live Stock Branch. Bulletin No. 72.

Two Diseases of the Horse.—Swamp Fever and Intermittent Fever (Equine Typhoid). Bulletin No. 71. Prepared by J. S. Fulton, D.V.M., 1923. Live Stock Branch.

Gasoline Engine Ignition.—Contributed by the Department of Agricultural Engineering. College of Agriculture, University of Saskatchewan. Agricultural Extension Bulletin No. 19.

Cheese-making on the Farm.—Contributed by the Department of Dairy Husbandry. College of Agriculture, University of Saskatchewan. Agricultural Extension Bulletin No. 17.

BRITISH COLUMBIA

Agricultural Statistics, 1922.—Bulletin No. 94. Statistics Branch, Department of Agriculture.

Feeding for Egg Production.—Bulletin No 93. With records of results obtained with S. C. White Leghorn, White Wyandotte, Barred Plymouth Rock, and S. C. Rhode Island Red Pullets. By E. A. Lloyd, B.S.A., Associate Professor of Poultry Husbandry, and V. S. Asmundson, M.S.A., Assistant Professor of Poultry Husbandry. College of Agriculture Bulletin No. 6.

Bee Culture in British Columbia.—Bulletin No. 92. By W. J. Sheppard, Provincial Apiarist, A. W. Finlay and J. F. Roberts, Assistants.

MISCELLANEOUS

Live Stock and Animal Products Statistics, 1922.—(Prepared in collaboration with the Department of Agriculture, Canada). Internal Trade Branch, Dominion Bureau of Statistics.

Fur Production of Canada, 1921-22.—Issued by the Fur Branch, Dominion Bureau of Statistics, Ottawa.

Preliminary Report on the Fur Farms in Canada, 1922.—Issued by the Fur Branch, Dominion Bureau of Statistics, Ottawa.

Canadian National Record for Foxes.—Volume 1. Containing the pedigrees of foxes inspected and registered 1920, 1921. Edited in the office of the Canadian National Live Stock Records, Ottawa. Published by the Canadian Silver Fox Breeders' Association, 1922.

Manitoba, Canada.—Its Development and Opportunities. By F. H. Kitto, F.R.G.S. Prepared under the direction of the Superintendent, Natural Resources Intelligence Service, Department of the Interior, Ottawa.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

The co-operative marketing of farm products, by O. B. Jesness, B.S.A., Montreal, J. B. Lippincott co. 1923. 292 p. il. (Lippincott's farm manuals, ed. by Kary C. Davis).

The American livestock and meat industry, by R. A. Clemen, M.A. New York, Ronald press co., 1923. 872 p. il. Bibl. pp. 811-841.

Supplying Britain's meat, by G. E. Putnam. London, George E. Harrap & co. 1923. 169 p. il.

Co-operative marketing; the golden rule in agriculture, by Herman Steen. Garden City, Doubleday, Page & co. 1923. 366 p. il.

Farm implements and machinery, by J. R. Bond, M.Sc. and Sir John Russell, F.R.S. London, Benn bros., ltd. 1923. 282 p. il.

Economie rurale, par E. Jouzier. Paris, J. B. Baillière et fils, 1920. 550 p.

Scientific feeding of the domestic animals, by Martin Klimmer, Ph.D., authorized translation by Paul Fischer, B.S.A. Chicago, Alex. Eger, 3d ed. 1923. 242 p. il.

Parasitologie des plantes agricoles, par le Dr. Maurice Neveu-Lemaire. Paris, J. Lamarre et cie, 1913. 720 p. il.

Economics for commercial students, by Albert Crew, 5th ed. London, Jordan & sons, ltd. 1923. 384 p.

Farm meats, by M. D. Helser, B.S.A., M.S. Toronto, Macmillan co. of Canada, 1923. 274 p. il.

Rural education, by Arthur W. Ashby and Phoebe G. Byles. Oxford, Clarendon press, 1923. 227 p.

Farm fertility, by Sydney B. Haskell. New York, Harper & bros. 1923. 243 p. il. (Harper's handbooks, ed. by W. C. O'Kane).

Outline of genetics with special reference to plant material, by Merle C. Coulter. Chicago, University of Chicago press, 1923. 211 p.

Frost und Licht als beeinflussende Krafte bei der Samenkeimung, von Dr. Wilhelm Kinzel. Stuttgart, Eugen Ulmer, 1913-1920. 3 vols.

Le travailleur agricole francais, par Georges Risler. Paris, Payot & cie. 1923. 281 p. (Bibliotheque politique et economique).

Agriculture commercialisee; pour bien produire, il faut bien vendre, par Armand Bouat. Paris, Librairie agricole de la maison rustique, 1922. 349 p. il.

Animal life and intelligence, by C. Lloyd Morgan, F.G.S. London, Edwin Arnold, 1890-1. 512 p.

Practical landscape gardening, by R. B. Cridland. New York, A. T. De La Mare co. 1922. 276 p. il.

Les principales maladies des habitants de la basse-cour et leur traitement, par G. Moussu. Paris, Librairie agricole de la maison rustique, 1922. 253 p. il.

History of the Smithfield Club, 1796 to 1900, by E. J. Powell. London, published by the Smithfield Club, inc. 1902. 168 p. il.

Poultry, by A. W. Richardson. New York, Harper & bros., 1922. 122 p. (Harper's handbooks, ed. by W. C. O'Kane).

Visual perception of the chick, by H. C. Bingham. Baltimore, Md. Williams & Wilkins co. 1922. 104 p.

The production of 300-eggers and better by line breeding, by M. E. Atkinson, Dayton, O. Reliable poultry journal publishing co. 1923. 415 p. il.

Horse-breeding for farmers, by Alfred E. Pease. Toronto, Macmillan, 1894. 135 p.

The principles of stock-breeding, by James Wilson, M.A., B.Sc. London, Vinton & co. 1912. 146 p.

Cinquieme congres des jardins ouvriers, Paris, 1920. Compte-rendu. Paris, Bureaux de la ligue du coin de terre, 1922. 226 p.

Profitable dairying, by C. L. Peck. New York. Orange Judd, 1907. 174 p.

Pig-breeders' annual, 1923. London, National pig breeders' association 1923. 67 p. il.

Range and pasture management, by A. W. Sampson. New York, Wiley, 1923. 421 p. il.

The American fertilizer handbook, 1923. Philadelphia, Ware, 1923. v.p.

Railroad freight transportation, by L. F. Loree. New York, Appleton, 1922. 771 p.

The shepherd's manual, by Henry Stewart. New York, Orange Judd, 1907. 276 p.

The fern lover's companion; guide for the Northeastern States and Canada, by G. H. Tilton, A.M. Boston, Little, Brown & co. 1923. 240 p. il.

Credit power and democracy, by C. H. Douglas. London, Cecil Palmer, 1921. 212 p.

The farmer's problem, by a farmer. London, John Murray, 1923. 47 p.

Hardy border flowers, by H. H. Thomas. Toronto, Cassell & co. ltd. 144 p. il.

Methods of seed analysis, by C. B. Saunders, B.Sc. Cambridge, National institute of agricultural botany, 1923. 15 p.

L'influence de la temperature et de l'eau tombee sur les recoltes de quelques varieties de froment a Svalof et a Ultuna, by Axel Wallen. Stockholm, 1920. 26 p.

The development of adult education in rural areas. London, H. M. Stationery office, 1922. 55 p.

Report of the Departmental Committee on foot-and-mouth disease appointed by the Minister of agriculture and fisheries, 1922. London, H. M. Stationery office, 1922. 78 p. (Cmd. 1784).

Report of the proceedings of the national milk conference, 1922. London, 1922. 222 p.

Hogs, by A. J. Lovejoy. Chicago, Frost, 1919. 212 p. il.

Insect pests and fungous diseases of farm crops, by A. Roebuck, F.E.S. London, Benn bros. ltd. 1923. 55 p. il.

Animal nutrition, by E. T. Halnan, M.A. London, Benn bros. ltd. 1923. 52 p.

Poultry keeping on the farm, by Edward Brown, F.L.S. London, Benn bros. ltd. 1923. 54 p. il.

Exportation of Canadian store cattle to Great Britain; information and recommendations for the Scottish market; full particulars of the classes of cattle to ship; the ports of landing and lairage accommodation thereat; expenses and cost rates, issued by William Bosomworth & sons, Glasgow, Scotland. Glasgow, 1923. 16 p.

Agricultural co-operation; a selected and annotated reading list, compiled by Chastina Gardner. Washington, Government printing office, 1923. 55 p. (U.S.D.A. Miscellaneous circular No. 11).

An economic survey of a rural parish, by J. Pryse Howell. Toronto, Oxford university press, 1923. 31 p. (Oxford university. Institute for research in agricultural economics).

Practical fruit farming, by R. G. Hatton and Walter R. Elgar. London, John Murray, 1922. 87 p. il.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

SCIENCE AND PRACTICE OF AGRICULTURE

ORIGINAL ARTICLES

THE HIGHER AGRICULTURAL EDUCATION OF THE FUTURE

By E. MARCHAL, Member of The Royal Academy of Science, Belgium, Professor of the State Institute of Agriculture, Gembloux

Nearly every country in the world possesses at the present time a system of Higher Agricultural Education representing in each case the most advanced stage of specialized instruction.

The actual role of this form of education as well as the question of organization are the subjects of much controversy. Consequently unless active measures are taken without delay, it appears that agricultural education in certain countries is faced with a serious crisis. It seems therefore desirable to determine clearly the ends which should be pursued in these higher studies, so that they may be brought into line with the present general requirements of agriculture.

To judge from prevalent opinion, particularly as shown in Belgium, two opposing points of view are expressed in the quarters most closely concerned. Higher agricultural education as at present organized has been accused of being too theoretical so that the student is not kept sufficiently in touch with the realities of practical work. For example, it is stated that "the training provided at the agricultural colleges is much too scientific; it inspires the farmers' sons with too progressive scientific aspirations, and instead of preparing them for rural life tends rather to alienate them from the work on the land."

For those who hold this opinion, the ideal function of the Colleges is to give careful theoretical and practical instruction in the most approved cultural methods to students preferably themselves originating from the classes directly interested in the cultivation of the soil and thus to train practical scientific agriculturists who will in the future, by their example and influence stand out as leaders in agricultural progress.

This desire to attract students from the country districts leads to the following characteristics in the arrangement of the programmes of study:—comparatively easy conditions of entry, limited duration of the course, a constant effort to give a practical bias to all the branches of instruction (including the basic sciences), the predominance of practical work on the farm and in the fields, over laboratory and lecture work.

The contrary theory is represented by those who consider that the function of higher agricultural education is not only to train students who will disseminate the knowledge of the progress already attained, but also, and more especially to prepare pioneers, research workers, and the moulders of future agricultural progress. With that object in view the courses at the agricultural colleges, leaving aside all questions of professional training, should develop still further the scientific side and definitely take their place amongst the recognized higher University studies.

The writer during a long professional career has become convinced that, agricultural education can best serve the special interests of agricultural science and the general interests of society by following the latter course.

The history of the great discoveries, which during the last fifty years have brought about the transformation of the art of cultivating the soil, hitherto in its rudimentary and empirical stage, into a complex and scientific industry, shows at each step the marks of the direct influence of pure science. Similarly the discoveries made by chemists and physiologists in their laboratories towards the end of the last century

have resulted in the establishment of fundamental laws which determine animal and plant production, while purely abstract biological theories are being utilized at the present time, as a basis for experimental work for still further enhancing the productivity of the soil. It is certain that the patient and laborious researches of MENDEL, followed up and developed by a multitude of experimentalists, are the real source of the first definite stages of actual knowledge in the mysterious realm of heredity. Through the mutation theory of DE VRIES and the pure line selection theory of JOHANSSEN, the Mendelian theory of heredity, still further confirmed as it has been by recent cytological research is dominant in the field of genetics, that most fruitful branch of biology, without which animal and plant breeding would be the merest empirism.

Viewed from another standpoint it must also be acknowledged that the purely theoretical work of mycologists and entomologists, by the light that it has thrown on the evolution of parasites in all its most minute details, has led to the establishment of a scientific basis for the methods of control of plant diseases and pests. Lastly, the peculiarly delicate investigations of bacteriologists and biologists have already begun to throw a certain light on soil microbian life and are opening up a prospect of interesting and profitable applications.

Everywhere and always, pure science constitutes the active source from which, although often it may be by long and devious paths, true practical progress is surely derived. The first stages in this development are multiple. The theory itself is almost invariably the work of scientists which is in no way concerned with the utilitarian aspect of the research work on which they are engaged. It is the affair of less original minds, with a more practical bias, to grasp its possible bearing as regards practical application. Then comes the testing of the new theory, and the stage of practical experiment and finally the general diffusion of the newly acquired knowledge amongst those to whom it is of importance.

However this may be, in any attempt to determine the part played by teaching institutions and research in furthering the great work of the scientific reform of agriculture it must be admitted that the aim should be, pre-eminently to secure the necessary liaison between pure theoretical science and practice and to select from among the original abstract theories of laboratory experts, the ideas that lend themselves to practical application, testing and adapting them to the actual requirements of agricultural technique and finally and above all, to arrange for their general diffusion. The creative side of such institutions although entailing much expenditure of time and energy, has been regarded as a general rule, as of relatively minor importance.

The reason for this situation is to be found chiefly in the method of recruiting professors and research workers, as it is too often the case, that less importance is given to high scientific qualifications than to technical skill on the "practical" side, without which, so it is said, any branch of science however far reaching, often remains sterile in the sphere of application.

The result is that too often the duly qualified leaders of agricultural progress, are not, owing to their lack of sufficient scientific training, fit to undertake original research even under favourable conditions. No other result could well be expected, seeing that the nursery where they are trained and whence they are often far too exclusively recruited, *i.e.* the institutions for higher agricultural education, is often marred by the same fundamental defect.

On the contrary, the march of agricultural progress might be made far more rapid and sure, and much of the labour, expense and trouble of testing and trials might be avoided if our agricultural scientists were given a superior equipment of pure science and could go direct to the original sources of the great discoveries for the maintenance of their activities.

Surveying the great problems in the light of their practical knowledge, and directing from the outset the resulting theories towards practical applications, they would cause science to become in the applied sphere, even more highly productive.

In the writer's opinion, the most urgent need of to-day is rather for true scientists, competent to achieve success in original research, rather than for able technicians or merely popular lecturers. The responsibility for training such men lies with higher agricultural education but if the work is to be adequately accomplished, higher agricultural education must develop and improve its methods and organization in at any rate many countries.

If the ideal scheme for training such highly qualified advisers on agricultural science and practice be considered, it will be seen that the course may be divided into two sections: a genereal scientific preparatory training and professional instruction proper. The first, owing to its specially comprehensive nature is the outstanding characteristic of agricultural instruction; briefly, it includes the various branches of mathematical, physico-chemical, mineral and biological sciences.

In each of these fields, it may be considered that the agricultural student should receive a training in no way inferior either in range or standard, to that required for a degree in pure science. In the writer's opinion the

bias in the direction of "practical application" which is so often abused in the methods of scientific teaching preliminary to specialization, constitutes a serious danger, as it tends, under the pretext that they are abstract and devoid of any practical interest, to the sometimes almost complete neglect of entire sections of science, such as might ultimately be found to provide a source of important practical applications. Such a theory tends to encourage imperfectly qualified students with a limited horizon and sphere of interest, who will always be incapable of carrying out original research to advantage.

The University with its great thinkers and vast and precious teaching resources, is undoubtedly the most favourable milieu for the purely scientific training of the agricultural scientists of the future.

It should not be difficult, by means of judicious interchanges in the programmes of the different faculties to establish an ideal form of complete preliminary instruction, leading up to the special agricultural studies.

The agricultural scientist of the future in the next stages of his training course would thus be enabled to build up his purely professional instruction on the solid foundations of the sciences in general. It is at this stage only that the professional faculty or, in other words, the Higher Agricultural Institute enters into the field. Situated in the country and in rural surroundings, where at every point the instruction can be refreshed and invigorated by practical demonstration, the Institute with its experiment farm, its research stations staffed with eminent scientists should prove a focus of applied science in direct and constant touch with the great general intellectual centre provided by the University town from which, consequently, it should not be too far distant.

The organization of the programmes of study and the method followed at this Institute will not be inspired by the essentially abstract conceptions of pure theory, but by the far more tangible and living requirements of science applied to practice.

In order, however, to safeguard, from the point of view of its specialized character, the type of education which is required, various dangers must be avoided. In certain special schools, though classed as of the "higher" rank, there is a tendency to make the professional instruction degenerate into a kind of technical initiation into the practice of such and such a branch of agricultural industry or speculation. Under the guise of exercises in the adaptation of theory to practice, the student is required to carry out processes and manual operations, which could be far better learnt after the completion of his studies during the course of the stage which every student should pass through before starting on his professional career.

The subject of practical application in higher professional instruction should take the form of training the student how to observe, measure and analyze, to complete his knowledge by means of documentation, and to initiate him into experimental method and individual research. Such studies, it may be added, should tend to occupy an increasingly important position in the time table as their teaching value is inestimable. It is pre-eminently in the study of practical applications and tutorial work that the professor will find his chief opportunity for acting as initiator and revealer; it is at the point of contact of theory with fact that he will best be able to show his mastery and acquire that moral ascendancy that will make his pupils respect and honour in his person both science and professional ability. This is also the stage where he cân most readily inspire the student with the love for research and the method to be pursued, by arousing his curiosity either in the progress and results of his special work or in other subjects equally capable of serving as a basis for original study. In short, the sphere of practical application will give the professor the means for establishing on more solid bases than those of an examination, a sound appreciation of the value and real knowledge of a student.

For the student himself, the practical exercises will provide the opportunity of obtaining the most solid and lasting form of knowledge, of developing his spirit of initiative and testing his capacities and of gauging personally his degree of attainment. But, as already stated, the object of demonstration work and practical exercises must remain always at a high standard, as the period which the student can devote to his higher studies is too precious to be spent in carrying out work of a purely technical nature.

Another danger to be avoided in the higher agricultural course is in the writer's opinion the tendency towards an exaggerated specialization. Agriculture viewed as a whole, undoubtedly occupies too vast a field to allow any individual to make a complete scientific study of all its branches. The agriculture of temperate and tropical countries respectively, forestry, horticulture, livestock, chemistry, technology and farm engineering, all form special branches of which an intensive study can be made with the object of training special classes of scientific agriculturists.

It is necessary however, to safeguard the general agricultural training which an extreme specialization would jeopardize and to avoid turning out men with an incomplete equipment, who, although well-trained in the minutest details of some particular

branch, remain, owing to their insufficient knowledge of general methods and broad principles, incapable of seeing, understanding and adapting themselves to what tåkes place outside the narrow limits of their own accustomed sphere of activity.

A high level of preliminary scientific education, a far-reaching general professional training and a moderate degree of specialization, such should, according to the views of the writer, be the qualifications which the agricultural scientist of to-morrow should be expected to supply.

It should be at once admitted that at present such a programme is already, at any rate in its essential lines, being carried out in several countries. Such countries have realized that the day of a relatively easy victory and diffusion of knowledge is ended and that for wresting from nature the secret of new wealth and for realizing the imperious claims of impoverished humanity in this troubled post-war period, for an increase in the productivity of the soil, an ever increasingly urgent appeal must be made to the aid of Science as the only true generating force of progress.

AGRICULTURAL METEOROLOGY AS A FIELD FOR INVESTIGATION

By Sir A. D. HALL, Chief Scientific Adviser, British Ministry of Agriculture

There are few questions which have more continuously occupied the attention of mankind than the attempt to establish some connection between weather and crops. Primitive man in all ages and regions has hoped to control as well as to forecast the weather, his methods and opinions are wrought into the ritual of his religion. Every country possesses its weather lore embodying traditional correlations of weather and vegetation.

Yet despite the universal and secular character of the observation devoted to it by farmers, even though in primitive times the existence of the community might depend upon the prediction and though in more civilized epochs vast sums of money might be made by successful forecasting, little real knowledge has been obtained especially in countries like Western Europe, possessed of variable weather rather than of settled climate. In ancient Egypt the Priesthood gained its power by its ability to foretell the rise of the Nile; what position might not be attained by men who could have predicted the character of the Indian Monsoon? It was not until systematic records of weather began to be kept that material for the study of correlations between weather and crop prediction were obtainable and even then but little could be made out from them. Probably Sir Napier SHAW's paper of 1905 marked the most definite step in this direction. He showed that the average yield of wheat in England could, in 5 seasons out of 6, be predicted with some accuracy from a consideration of the rainfall in the previous autumn. Taking 39·5 bushels per acre as a maximum, deduct 1·25 bushels for every inch of rain that fell in the previous autumn, and a close approximation to the average crop of the year will be obtained for the great majority of seasons. The foundation for the wheat crop is laid in those months and only in some exceptional seasons does some weather factor in the later development of the crop overthrow the edifice which could normally be erected on the foundations laid down in the earliest stages. What value would Sir NAPIER SHAW's rule not have been to a wheat merchant or speculator in the earlier days when the price of English wheat was determined by the home production and not by the world's crop? Sir NAPIER SHAW's generalization was a year or two later followed by Mr. R. H. HOOKER's investigation of the correlations to be found between the weather and crops of the east of England, and the method he employed of correlation has been extended by other investigators, of whom we may mention WALLEN in Sweden, WARREN SMITH in the United States, and JACOB in India.

This, broadly, is the field of agricultural meteorology--ultimately to predict crop yields from the weather prevailing during their growth. Bound up with the problem, is the determination of the effects of this or that weather element in the growth of the crop at various stages, and weather forecasting itself. It is for example, possible to forecast the occurrence of night frosts and to make provision against them by smoke screens, during the critical period when fruit blossom is setting.

The cultivation and manuring of many crops might be varied to advantage, if one could predict the general character of the weather even a month or two ahead.

From the work already done there appears to be three methods of investigation open. The first, which is purely empirical and depends only upon the analysis of the records available of past happenings, is to trace the existence of some periodicity in crop production and in weather. Many attempts have been made to determine cycles in cosmical phenomena and to ascertain their effects upon weather, the best known example being perhaps BRUCKNER's period of

35 years and the sunspot cycle of 11-12 years. The difficulty is to obtain data of sufficient accuracy and duration to permit of exact mathematical discussion. One of the most interesting of these attempts is that founded upon an examination of the annual rings of growth of the giant Sequoias of California. As is well known, a tree puts on a ring of growth every year which by its colour and structure can be differentiated from the rings formed in previous and succeeding years. In an ordinary way by counting these rings we can determine the age of a tree that has been sawn across and polished so as to yield a clean section. But we can go further, for the breadth of the ring along any radius varies and affords a measure of the growth made in that season and that growth represents a rough summing up of the character of the weather as favourable to vegetation or otherwise. DOUGLASS summarizes the results of the examination of the rings of about 450 sequoia trees of which the great majority are over 1,000 years of age and as many as 79 over 2,000 years. He finds that the correlation of growth with rainfall is greatest when a period of years is taken, the best results being obtained when a three-year period is taken for trees in dry situations and a ten-year period for trees in moist situations. There is a lag in the movement of the rainfall to the soil in which the trees grow and owing to the natural storage of water in the soil it is only the cumulative effect of several seasons that is reflected in the growth of the tree. Sir WILLIAM BEVERIDGE is attacking the same sort of problem from another angle. Records exist of the price of corn on various markets in Western Europe for the last four hundred years. Up to about 1870 when ocean transport began to develop so extensively and wheat began to arrive in Europe from the Americas, these prices represented the local yield of crops, for there was no means of relieving local scarcity by importation on a large scale or of passing off a superfluity to less favoured districts. These prices can be made to afford an index of production with the proviso that there is a certain cumulative effect to be taken into account. An abundant harvest in one year will produce a carry over which will mitigate a scarcity in the succeeding season, or two or three consecutive unfavourable seasons will so exhaust the stores as to result in something approaching a famine. Given such data, what remains is a prolonged mathematical discussion which will eliminate the cumulative effect and reveal the existence of recurring cycles of good and bad harvests.

Indeed, Sir WILLIAM BEVERIDGE'S preliminary discussion seems to indicate the existence of several minor cycles as well as or perhaps resulting in a major cycle for which there is strongest evidence, which has a period of about 15·3 years. Of course the subject is fraught with difficulty, for scarcity is not the result of one factor; it may on one occasion be due to drought, on another to excessive and long continued rainfall, it may again be caused by mistiming of otherwise favourable elements. There may be distinct cycles for the different weather elements, say of drought or of rainfall, and as these cycles are not necessarily of whole year periods their recurrence may be favourable or the reverse according to the season at which they happen. For example a period of drought in the late autumn or winter will be favourable to winter wheat, whereas a similar drought in April-May might injure the winter wheat and practically wipe out the spring wheat crop, which is the main source of supply in Eastern Europe. A heavy autumn rainfall is most adverse to the subsequent yield of winter wheat, whereas the same amount of rain during the growing period might, if followed by good harvest weather build up an abundant yield. It is known that Sir WILLIAM BEVERIDGE is pursuing his investigation of this class of data. Other analogous materials may be found which will repay examination and may lead to the detection of broad weather cycles that will be helpful towards production in the future.

The tracing of cycles deals only with the broad resultant effect of all the elements of weather. Mr. HOOKER'S method attempts to discriminate between them and to trace the effect of each upon the final crop. Moreover, he divides his year into periods of eight weeks, so that his results indicate the effect of an excess or deficiency of the element at particular times of the year upon the size of the crop. His data are the statistical records of crop yields in the east of England for a period of 21 years beginning in 1885 (since extended to 35 years), and these he correlates with the rainfall and temperature records for the same district. He determines the correlation coefficient not only for the year of growth, but also for the preceding year, the weather of which is often found to have a marked connection with the yields in the subsequent year, even if the crop had not then been sown. For example, with the wheat crop wet weather in late spring, and dry weather in the later summer are moderately correlated with a good yield, but dry weather in the autumn and late winter are much more favourable. Cold in late spring is associated with a good yield, but the favourable effect of heat in the previous summer and early autumn is even more marked. It is clear from Mr. HOOKER'S results that the same weather elements are not equally favourable for all crops in the east of England. Most of them benefit by a dry previous winter, but in late spring the weather requirements of wheat and potatoes are reversed, dry hot weather being favourable to potatoes, whereas wet and cold conditions are associated with good

wheat crops. One cannot study Mr. HOOKER's results without beginning to speculate upon causes. One can see a variety of reasons why a dry, warm autumn should be favourable to the subsequent wheat crop. In the first place it makes for good cultivation, the seed is put in on a good tilth and not plastered into mud. The average date of sowing is earlier, because the farmer can get on with his operations and in England early sowing is favourable to a good yield. Germination is more rapid, bacterial actions producing plant food are favoured, the plant gets established before the winter. Again, a dry winter is favourable in that it induces an extensive root growth, which renders the plant more independent of subsequent drought. In a wet winter with a saturated soil the root development is curtailed, the plant has a smaller volume of soil from which to draw either water or nutriment, and thus becomes more liable to lodge when the heads become heavy. Many such causes may be traced more or less imperfectly, some are first hand—the direct action of the weather upon the growth of the plant, others are secondary in that the weather is favourable or adverse to the incidence of disease or the fostering of weeds. Some are still more remote such as the effect of weather on the farmers' application of labour. A protracted harvest one year may throw many of his operations out of gear in his preparations for not only the next year's wheat but for his other crops.

The correlation method has the advantage of making no hypotheses as to causes, it reveals the frequency with which one set of facts, facts in the nature of results, tend to be associated with another set of facts which may or may not be causative. Obviously the claim of causation is strengthened if from another side evidence can be adduced to explain such a sequence. And this leads us to the third class of investigations that are necessary in agricultural meteorology. We may attempt the intensive study of a given crop in its response to the weather conditions under which it is growing, in order, for example to ascertain the meteorological factors which are significant in its development. We are all in the habit of using the expression "a growing day." What elements constitute the combination which makes for vegetation? Moisture in the soil, humidity, temperature, illumination, are all likely to play their part; can we establish by experiments the optimum conditions and their dependence one upon another? The problem is inevitably complex because the effect of some elements such as temperature is not always positive. Growth may increase with rising temperature up to a point when further increases become unfavourable and the effect is negative. Again, any one of the elements may become a limiting factor; for example water supply and temperature may be sufficient, but growth may be limited by deficient illumination. What are the limiting rates for each of the elements when the others are at their optimum, and which of them are likely to be operative under average conditions? The investigation is not an easy one, even the choice of test plants presents difficulties. If we are measuring vegetative development, we can take as index the increase in length of the shoot, or even weigh the dry matter produced in a given time. But we have also to take into account the age of the plant and the amount of previous development. If a plant has grown well during its first stage it will be the better able to make use of favourable conditions in the second period; in other words weather conditions favourable or unfavourable have a cumulative effect on the final production. Still, these difficulties can be overcome and when working on a small scale, the weather factors may to a certain extent be controlled so as to reduce the experiment to a single variable. We might for example be able to maintain water supply and illumination at an optimum and determine the effect of temperature. Even then the problem presents further difficulties because vegetative growth is only one part of crop production. We can for example by excessive supply of nitrogen compounds enormously increase and prolong the vegetative development of the wheat plant but it does not follow that we can under normal conditions of climate obtain a corresponding increase of grain. The plant may prolong its growth until the season does not permit of much grain formation or of its ripening. In the case of the winter wheat crop we can distinguish three or four distinct periods of development, each demanding its own weather conditions. In the autumn or winter, root development is all important, for which we have seen a comparatively dry soil is favourable. Next follows the vegetative period proper of aboveground growth. Then the plant enters upon the stage of migration, when the material accumulated in leaves and stems is moved therefrom and remade in the grain. This period overlaps the former one, for in an English type of climate, at all events, assimilation of material from the air and from the soil does not cease with the formation of grain, though it gradually runs down to a minimum before the process is complete. In continental climates with high summer temperatures the stage is probably more sharply defined. There is evidence that warmth is favourable to the migration process, on the other hand it may be curtailed by excessive dryness. The migration process merges into the last stage of mere ripening, when from the physiological point of view the weather can affect the yield but little; but when frost, excessive rain or wind may have a serious adverse effect upon the

commercial yield. One of the fields for investigation thus becomes the determination for each crop of the critical periods of its development and the particular weather conditions that are dominant in each period. The work then becomes associated with investigation by the correlation method, because it becomes possible to concentrate attention upon the critical period and to establish a causal instead of a merely empirical connection between the crop production and the weather.

Intensive investigation of the kind under discussion may also lead to the further knowledge that is needed concerning the meteorological data to be obtained in order to be of service in the study of crop production. It is uncertain whether those at present collected by meteorologists are such as have the most bearing upon the development of vegetation. Rainfall has for example two effects, it determines the water content of the soil upon which depends the water supply to the crop, and it influences the humidity of the air, which again effects the development of the plant. Clearly the distribution of the rainfall as well as the absolute amount within given periods is a factor, but it is not obvious how to use the rainfall records so as to translate them into figures bearing directly upon plant growth. It may be desirable to obtain records of the moisture in the soil though it is difficult to establish the unit of measurement in view of the variation induced by the nature of the soil itself and its situation. As regards temperature, the usual data provided are the daily records at 9 a.m., the maxima and minima and less generally the traces given by self-recording instruments. From these with more or less accuracy, the accumulated temperature in hour degrees above a chosen datum line may be calculated, but research is still needed to determine which is the best figure to use as having a causal connection with plant development. Again as regards humidity, we have in the first place to choose between dew point determination and the percentage of possible humidity. When, again, within the day should the humidity be determined or should some integrated figure representing the average humidity of the day be aimed at? Some measure of evaporation may prove to supply a better measure of the effect of the atmosphere upon the plant than humidity determination.

As regards radiation our ignorance is even greater. Sunshine records are generally available and it may be of more service to determine total solar radiation. Beyond a certain intensity sunshine may have a negative effect upon vegetative growth, inasmuch as it induces the closing of the stomata, and the partial suspension of transpiration and respiration.

These are all questions upon which the plant physiologist working intensively upon the individual plant, must reach some conclusion before the investigator applying the method of correlation can know what meteorological data are necessary to him as being causally connected with crop development.

Some further consideration must also be given to the data for crop production, which the investigator of agricultural meteorology has to use.

With few exceptions statistics of crop production are estimates obtained in each country from a corps of observers, more or less trained for their work. Like all estimates the results are subject to certain general errors of which the most important in this connection is probably the tendency to smooth the actual curve of varying yield. Big crops are under-rated, while the yield is often over-estimated in bad years. The effect of this is to obscure the correlations that would otherwise be obtained, at any rate to blunt the sharpness of the conclusions that could be drawn. It has been suggested that much more exact index of production could be obtained if in the country in question some convenient number, say, 50, of farms were selected, suitably scattered over the country, reasonably typical of their district and stable in their management, and the actual yield per acre for the standard crops were measured on these farms. The mean of the yields thus ascertained would give not perhaps the true yield per acre of the country, but an index figure that would vary from year to year with the true yield, a figure which might represent with a degree of accuracy, depending upon the number and choice of the measurements made, the fluctuations in production of that country in response to seasonal fluctuations. An index figure so obtained would be valuable not only to the investigator of meteorology but to statisticians generally. The question is however too general for discussion here.

Enough perhaps has been said to show that the question of data is of prime importance in the still infant science of agricultural meteorology. It is a difficult subject in which for some time to come progress is not likely to be rapid, but for that progress above all investigation is necessary. The meteorologists are still in the main waiting for a lead from those concerned with the agricultural side of the problem and that lead can hardly be forthcoming until further research has been carried out on the reaction of the crops to the various elements of weather.

CROPS AND CULTIVATION

166.—Arsenate of Sodium in Soil Fertilization.—Riviere, Gustave, and Pichars, Georges. *Annales de la Science Agronomique Francaise et Etrangère*, Year 39, No. 6, pp. 366-370. Paris, 1922.

The author concludes from the results of his experiments that arsenate of sodium in small quantities (two or four gm. per square metre) has no injurious effects upon farm crops, but is sufficiently toxic to kill the protozoa which destroy the useful soil bacteria. Like other similar substances, sodium arsenate exercises indirectly a fertilizing action.

169.—Value of Lime and Inoculation for Alfalfa and Clover on Acid Soils.—Graul, E. J., and Fred, E. B., *Agricultural Experiment Station of the University of Wisconsin, Research Bulletin* 54, pp. 1-22. Madison, Wisconsin, 1922.

The authors have demonstrated the value of lime and inoculation for alfalfa and clover on acid soils. Field experiments were carried out on two types of soil, representative of a large area of Wisconsin silt loam, left without cropping for thirty years, and similar soil cropped regularly, and sand cropped for many years. The acidity was equivalent respectively to 1·04 gm., 0·86 gm. and 0·21 gm. of calcium carbonate, per 100 gm. of soil. In the earthenware jar tests, the soil was kept at about 50 to 60 per cent saturation with distilled water. The finely ground limestone contained about 60 per cent calcium carbonate and 40 per cent magnesium carbonate. The rate of application of potassium and phosphate was 516 lb. per acre. The effect on the sand was marked, almost negligible on uncultivated silt loam, and slight on cultivated silt loam. In the field experiments this application was omitted.

On the silt loam, inoculation would suffice to greatly increase the yield in the total amount of nitrogen. However, the combined treatment of inoculation and liming still further augmented the increase, *e.g.* in the greenhouse, inoculation alone gave an increase of 15·6 per cent alfalfa (4 cuttings); and liming 40·2 per cent, and the combined treatment 49·7 per cent and an increased nitrogen content to 52·3 per cent. On uncropped soil the increase amounted to 70·3 per cent yield and 79·4 per cent nitrogen (3 cuttings). In the field experiments the results were even more marked—the increase in alfalfa yield was 67·1 per cent after inoculation and 120·4 per cent with combined treatment (liming at the rate of three tons per acre). Still more marked increases were obtained when 8 tons of limestone were added. Nodule bacteria alone increased the nitrogen percentage (87·7 per cent) and adding limestone 160·2 per cent.

On sandy soil, calcium carbonate in addition to inoculation resulted in an increase of 182·8 per cent and gave 319·7 per cent nitrogen (clover).

As a general rule liming has proved more effective on dry land rather than on fertile soil, for example, on poor sandy soil, the nitrogen increase for alfalfa was 87·5 lbs. per acre for each of 5 cuttings, whilst on more fertile silt loam the increase was only 41·3 lb. Small applications of lime are advised; an excess is not only useless but occasionally has a deleterious effect, as is shown by the following typical example. On soil cropped with clover the amount of nitrogen per acre for one cutting was as under:

Clover unlimed.....			100·2 lb.
" 1¼ tons calcium carbonate			140·0
" 2½	"	"	72·8
" 5	"	"	12·5

The amount to be used should be measured according to the proportion necessary for plant requirements. This corresponds to from ¾ tons per acre on silt loam and to 2 tons on sands.

The use of calcium sulphate gave inferior results as regards crop yield, and calcium acetate gave the maximum yield and maximum amount of nitrogen when applied at the rate of one-half the full equivalent of calcium carbonate.

Observations indicate that plants obtain a certain percentage of nitrogen from the soil and the remainder from the air.

Soil Aeration.—Romell, L. G., of the Swedish Institute of Experimental Forestry, in *International Review of the Science and Practice of Agriculture*, April-June 1923, pp. 281-297. Reviewed by Dr. P. H. Bryce, Ottawa.

A study by M. Romell of the factors which enter into the problem of soil aeration and the practical effects of aeration on plant growth, is of great scientific interest as supplementary to former studies of a very difficult physical problem.

Roughly speaking plants obtain their nutrition through two sources, the gases of the air, chiefly its carbonic acid, and the soluble salts contained in the water of the soil. The study shows that the presence in the soil of plant foods depends upon the free entrance of the air into the upper 8 or 10 inches of soil for shallow-growing plants and to greater depth for trees and deep-rooted plants generally.

3. The amount of free air spaces in the soil depends on the size of the interstices between the soil particles, varying from a capacity, in sands for holding water before it leaks out

of only 25 per cent, in loams of 50 per cent, and in forest humus and clays of from 65 to 75 per cent of the volume. Romell points out, what has been noted before, that the air near the earth as in the forest and near the plants contains more carbonic acid than normal air; and that its source is the soil. Thus during plant growth Romell estimates the amount of carbon transformed into plant tissue during a week of growth per hectare (about two acres) as amounting to a maximum of 900 kilograms or roughly 2 pounds per week. Or more exactly, Romell found that 7 litres of carbonic acid are given off from a square metre (rather over a yard) in 24 hours over cultivated fields. The amount of this given off from the upper 8 inches of soil would be fourteen times this amount if the gas could not escape either above or below.

4. Of course, if the soil is filled with water there can be no air circulation, but so soon as the water evaporates or sinks deeper the spaces in the soil become filled with air. Now as to what this air consists of will depend on the amount of organic materials as manures in the soil, which become the food for bacteria in the presence of oxygen got from air circulation in the soil, and which is utilized to form carbonic acid and ammonia, which goes to form soluble nitrates available for plant food.

5. Now Romell uses the amount of carbonic acid present in a given cubic metre of soil as an indicator of the circulation of the outer air with its contained oxygen in the soil, and has made a detailed estimate of the most important conditions which enter into the diffusion of the gases and air in the soil.

6. He has grouped the factors under five heads, those of temperature, atmospheric pressure, water, wind and diffusion. Romell has shown that the effect of temperature on the volume of the air in the soil is slight, the variation being only from 1-600 to 1-800 of the normal aeration, since as the ground gets heated so do the air currents near it. It may however, be very considerable in coarse-textured soils, the normal rate of diffusion for an average of soils being from 0·05 to 0·11 square metres per second. But so soon as the area of the soil spaces approaches the size of the free path of the air molecules, the diffusion process is no longer normal, even for very close clays.

7. Naturally air diffusion is slow in damp soils, and ceases when the pores are filled with water. Further, the more the bacterial activity is concentrated in the upper soil, the greater is the diffusion factor. This is chiefly within the upper foot of the soil under ordinary cultivation. This is admirably shown in a diagram shown in the article under review.

8. Thus there is an excessive air diffusion in the upper 6 to 8 inches of soil, and in such depths of soil thorough aeration or ventilation of average soils not too damp or fine grained and the process is continuous. None of the other factors ordinarily plays any such important part as diffusion. Any standard such as a complete air renewal in the upper 6 to 8 inches in an hour may be taken for comparison, and this is most practical since it is in this upper layer that the bacterial activity is most intense, and is largely negligible at greater depths.

9. It is further important to know that it is the size of the interstices or lacunar spaces, which is of the greatest importance rather than in the size of mere surface openings. Hence the agriculturist must take pains to insure the necessary permeability. The higher the activity demanded the greater the porosity required. Thus the breaking up of the soil by cultivation when a liberal supply of manure has been added and the climate is hot, promotes greater soil aeration.

10. If the wind played a great part in this air circulation it would be important that the surface be left in clods and not pulverized. The essential point to insure soil aeration is porosity, and this is generally greatly lacking in a heavy soil. Well-worked garden soil is the type of intense activity due to the nitrifying bacteria of the soil.

11. But this cannot go on in soil of too fine texture, badly aerated. The only condition for aeration of a close heavy soil is drainage of the subsoil. Rain fills the air spaces and also takes up and holds fine soil particles, and greatly hinders aeration. Hence breaking up the surface after a heavy rain is most desirable since the air spaces of the surface are filled and the air movement is prevented. To prevent this it is advised that the surface be covered with straw litter or similar materials and even clods; but best of all, provision should be made for subsoil drainage to draw off the water and prevent the crust forming.

12. Unsatisfactory results often follow planting too closely both in horticulture and agriculture due to insufficient aeration of roots. Too deep planting lessens air diffusion. In Germany, ventilators have been added to the subsoil tile drains to increase aeration, but probably its good effects are mostly due to the increased drainage of soil. In fact the most serious hindrance to good aeration is excess of water in soil; hence the removal of useless water is the surest way of allowing good soil ventilation. Soil too fine as procelain clays make aeration practically impossible.

210. — Poisonous Metals on Sprayed Fruits and Vegetables. — LYNCH, W. D., HAYWOOD, J. K., QUAINTANCE, A. L., WAITE, M. B., *U. S. Department of Agriculture, Bulletin No. 1027*, pp. 66, bibliography. Washington, 1922.

Study undertaken to ascertain the amounts of arsenic, lead and copper remaining on fruits and vegetables treated with poisonous sprays.

Results of previous investigations are given, followed by a description of the experiments made with peaches, cherries, plums, apples, pears, grapes, cranberries, tomatoes, celery and cucumbers. Various methods of analysis were employed.

The following general conclusions may be drawn:

Comparatively large quantities of spray residues were found only when sprayed to excess, or in the case of late sprayings. In one instance 0·13 per cent of lead was found on apples (dried fruit). The poison is liable to accumulate in the calyx. This indicates the importance of strictly adhering to the regulations recommended by the Bureaus of Entomology and Plant Industry. Practically all of the spray residues can be removed by peeling the fruit.

LIVE STOCK AND BREEDING

67.—**Breeding Cattle for Milk and Beef Production.**—I. Will the Farmers' Cow Come Back? *The Breeder's Gazette*, Vol. LXXXII, No. 5, pp. 109-110. Chicago, 1922.

II. Dual Purpose Cattle in England. *The Breeder's Gazette*, Vol. LXXVII, No. 6, pp. 141-142. Chicago, 1922. Among English Dual Purpose Shorthorns. *The Breeder's Gazette*, Vol. LXXXII, No. 7, pp. 175-176. Chicago, 1922.

III. Dual Purpose Cattle in America. *The Breeder's Gazette*, Vol. LXXXII, No. 8, pp. 207-208. Chicago, 1922. The Dual Purpose Idea Has Been Accepted. *The Breeder's Gazette*, Vol. LXXXII, No. 9, pp. 230-231. Chicago, 1922.

IV. Tillsson, E. H., A Brief for the Milk and Beef Shorthorn. *The Breeder's Gazette*, Vol. LXXXII, No. 13, p. 443. Chicago, 1922.

V. Ash, E. C., Can the Red Poll Become the National Breed? The Evolution of the Dual Type. *Live Stock Journal*, Vol. XCVI, No. 2538, p. 514. London, 1922.

VI. Can the Red Poll Become the National Breed? *Live Stock Journal*, Vol. XCVI, No. 2539, p. 539. London, 1922.

VII. Newton, C. F., Dual Purpose Cows' Persistence in Milking. *Live Stock Journal*, Vol. XCVI, No. 2540, p. 571. London, 1922.

X. Miller, W. L., Developing the Dual Purpose Herd. *The Breeder's Gazette*, Vol. LXXXII, No. 5, pp. 110-111. Chicago, 1922.

I.—The author describes the dual purpose cow (bred for beef and milk production) as follows: the animal weighs, when in good condition, 1,100 to 1,500 lbs.; during the lactation period, it yields 500 to 1,000 gall. of milk, and fattens easily when dry, giving a high dressing yield; the meat is marbled and savoury. The dual purpose cow is more resistant to disease than the specialized animal bred for either milk, or beef, production.

Seventy years ago, there were many dual purpose cows in the United States; for the farmers in those days were constrained by circumstances to keep this type of animal which has been perpetuated and improved by natural and artificial selection.

Then agriculture developed, and industrialization and specialization arose. Improved breeds of milk, or beef cattle were imported, and the beef of the dual purpose cow could not compete with the cheaply produced meat sent from the ranches of the far west, while her milk yield fell far below that of the breeds of heavy milkers used to supply the towns.

The exclusive production of either meat or milk does not, however, suit all districts, and many farmers cannot specialize in either butcher's beasts, or dairy cows. The breeding of dual purpose cattle would not be prejudicial to the single purpose breeds. To obtain the first type of animal, it is necessary to breed for several years from parents belonging either to beef, or milk, breeds. Single purpose herds, on the other hand, can sometimes be improved by a dual purpose bull. Further, specialized breeds of cattle fill their own place in the production of animal products, and thus have little to fear from the appearance of a new type, while certain areas are not so well suited for rearing dual purpose cattle, as for breeding dairy, or beef animals.

In districts where much maize is grown, it would be profitable to rear more cattle; in this case, the author is of the opinion that the dual purpose cow is to be recommended.

Milk consumption in the United States will probably increase, and customers will become more particular that the milk shall come from healthy cows. As specialized animals are liable to disease, it will be necessary for dairy farms to become larger. The milk of cows belonging to large herds is more wholesome than the milk from small intensive dairy farms found in the neighbourhood of towns.

The improvement of means of communication and the extension of motor-lorry transport will promote the development of the dairy industry, as butter-factories will be able to buy their cream from little villages in the provinces and thus provide a market for the milk of dual purpose cows.

II.—The author made a tour in Cumberland and Westmoreland (England) in order to obtain information on the subject of breeding dual purpose Shorthorns. These cattle have been continually selected for beef and milk production. They are well-

shaped with straight back, well-developed udder, soft skin, and have usually a roan or white and red coat. The individuals are very true to type, although the author thought the adult cows rather small. On remarking this to a local breeder, the latter explained that size was not required in a dual purpose breed, for the Westmoreland cows give as good milk and as much milk in proportion as larger cows; they inherit beef and milk yielding properties which they transmit to their descendants and are excellent dual purpose stock, whatever may be the weight of the females.

One farmer who was boasting of the good milking capacity of his Shorthorns remarked that all these cows are good beef animals, while another admitted that it was not easy to maintain the equilibrium between milk and beef production, but if the cows yield plenty of milk and fatten easily, their calves will be satisfactory to the breeder and the butcher, while the type can be corrected or maintained, by having the cows served by bulls which will increase the aptitude for either milk, or beef production in the calves.

British breeders of dual purpose cattle replace the cows in their herds as quickly as possible. thus getting rid of worthless cows before they get old, and lessening the number of worn-out animals to be fattened. In this way, the meat remains of good quality. The bulls used on farms where dual purpose cattle are reared are taken either from beef, dairy or dual purpose herds.

These bulls, when adult, are generally very large, long and deep; they have very straight backs and carry their heads high. The best are the offspring of good milch cows. A satisfactory bull must have a dam with a heavy milk yield, and in some herds will have more value, if its paternal grandmother was also a good milker.

The calves are reared on whole milk. Shortly before weaning, and directly after weaning, they are given large quantities of dry, or green, forage, rich in protein.

The farmers of Cumberland and Westmoreland are convinced of the advantage of breeding dual purpose Shorthorns. In the opinion of these breeders, specialized herds need particular care and are very expensive to keep. Further, beef and milk are too valuable as human food to be sacrificed to each other, when it is possible to obtain both from one animal. An over-specialized cow is not adapted for breeding, as if she is a heavy milker the calf is often fattened and sent to the butcher in order that the dam's milk can be sold.

III.—The author applies the conclusions reached in the preceding article to the situation of cattle breeding in the United States. He is inclined to believe that the present agricultural crisis will have the effect of causing the farmers to return to mixed cultivation, as specialization only increases their risks. On these mixed farms, many dual purpose cattle will be bred, although of late, there has been a tendency to breed dairy cows chiefly. The consumption of milk may be expected to fall with the increased meat consumption therefore it will be profitable to rear stock producing both milk and beef. The elements for forming herds of dual purpose animals are to be found in the Shorthorn, Red Poll, Devonshire and Brown Swiss breeds. If the author had to start such a herd, he would choose good milkers from the Milking Shorthorn and Beef Shorthorn varieties, and purchase the best dual purpose bull (out of a very heavy milker) he could obtain. He would then proceed to improve the herd's milk and beef production by making every effort to breed large strong cows of beef cattle type.

If the herd was already established, he would procure one dual purpose bull and another bull belonging to the beef breed, such as the Shorthorn, Aberdeen Angus or Hereford. The first bull would sire calves intended for breeding purposes, and the second the calves to be sent to the butcher.

IV.—Anyone attempting to breed Shorthorns solely for milk, or only for beef-production, is working against the hereditary tendency of the breed, and thereby loses half the yield of the animals and forfeits half the profit he might obtain from them.

At the present time, dual purpose cattle are greatly needed to fertilize the crops of the maize, cotton, and wheat belts.

V.—Until 1916, Red Polls did not thrive in England. This was largely due to the fact that few breeders owned animals with the typical characters of the breed. Since that time more care has been taken to obtain cattle true to type. Many large herds, among which must be mentioned the Gressenham herd, were broken up. Animals with Gressenham blood had a great effect in improving the milk yield of a very large number of Red Poll herds.

The author is of opinion that breeders should rear cows of the type of Meadow Ruby, Sudborne, Minerva, Dallinghoo Blossom, Gressenhall Molly, etc., and weed out all animals of inferior quality. Every cow should give 800 to 1,000 gals. of milk, and at the same time retain her fattening capacity. This, however, is not all that is required, for cheap milk and meat are in request. The Red Poll comes from East Anglia where there are many poor pastures, and is therefore characterized by its capacity of fattening on grass of inferior quality, and under unfavourable conditions.

VI.—If a farmer wishes to be successful in breeding Red Polls he must choose the dual purpose type which is more profitable.

The author mentions one herd of Red Polls of which the cows gave annually 800 gals. of milk with a fat content of 4·3 per cent, The bulls produced by these cows turned the scale at about 1,300 lb. when 30 to 36 months old. From the time they were weaned, nearly three months before their sale, these animals had not been fed on any kind of cake or meal.

The Red Poll must not be expected to give too heavy a milk yield. Over 1,000 gals. would be prejudicial to beef production.

To deprive the Red Poll of its dual purpose capacity would mean to lessen the longevity of the breed.

VII.—It is often said that the dual purpose cows ought to be fattened and sold after their 4th or 5th calving, as their defective constitution does not permit of their producing enough milk. The author, however, mentions many Red Poll cows which when already advanced in age still yielded a large quantity of milk. 8430 Daffodil gave 920 gals. annually after her 10th calf; 1117 Daffydowndilly 940 after her 9th; 12619 Meadow Blush 2nd 792 gals. after her 12th; 17126 Meadow Blush yielded during her 15th year 930 gals. of milk; 17209 Flodmore Ruby when between 6 and 14 years of age, gave on an average 1,218 gals. of milk and when 16 years old, while Kitchener Daffodil gave 870 gals. of milk after her 16th calving.

X.—The great problem of breeders of dual purpose cows is the maintenance of an equilibrium between milk yield and meat production. The feeding of the heifers is of paramount importance in this connection. As production is correlated with assimilative capacity, it is necessary to aim at increasing the latter. The author recommends the following system of feeding young stock.

Whole milk must only be given to a calf after the first week, after which time it must be gradually replaced by skim-milk, so that when the animal reaches the age of three months it is given no whole milk. To the skim-milk may be added "grains" (oats, maize and bran) as well as hay. This diet develops the absorption capacity. Hay plays an important part in the feeding of heifers. The best hay is obtained by sowing a mixture of meadow clover (*Trifolium pratense*), Alsike clover (*Trifolium hybridum*) and Timothy grass (*Phleum pratense*).

This system of feeding should be continued throughout the growing period and until the time the heifer is sexually mature. The author advises that heifers intended for breeding purposes should be mated directly they are full-grown, before they have lost their feminine shape, and their flesh becomes hard. As soon as they are in calf, they should be fed more liberally, in order to encourage the growth of the foetus and the development of the dam.

82.—Pork Production.—VOITELIER, CH. *Revue de Zootechnie*, No. 12, pp. 187-210, figs. 7, tables 3. Paris, 1922.

The fluctuations in the price of pork are largely due to ignorance of the quality of meat most in demand, and of the food necessary to obtain a first-class product.

For the last fifty years, the consumption of fresh pork has increased at the expense of salt pork. The relative value of lard as compared with lean meat has fallen.

The author is of opinion that a larger consumption of bacon, viz., of slightly salted meat from which the salt is removed before the smoking process, would be most advantageous to the pig-breeding industry. For bacon of the best quality it is necessary to have pigs weighing from 88 to 130 lb. and giving meat with a relatively small amount of fat.

In the meanwhile, however, it is imperative to produce the articles most in demand *i.e.* fresh pork and salted pork.

The results of experiments conducted at the Wisconsin Experiment Station have proved that the nutritive value of the meat of young animals is less than that of older pigs, but the money value is not proportionate to the nutritive value. One pound of rather lean meat containing sufficient fat to be savoury, fetches a higher price than one pound of fat meat.

On the other hand, it has been found that the pig's power of assimilating nitrogenous substances decreases regularly with age; further, the yield of a young pig given an insufficient amount of milk from its birth, is lower than the yield of an animal that has been more liberally fed.

From experiments carried out twenty years ago in Denmark, it appears that there is an optimum age for slaughtering young pigs after they are weaned. The determination of the right moment depends upon the net cost per pound of meat and the condition of the market.

The method of rearing swine plays a great part in the growth of the animals in determining the quality of their meat. The author believes that rearing pigs out-of-doors can only have a favourable effect upon the quality of the pork especially in the case of pigs sent to the butchers when they weigh 130 lbs.

From these data, the author draws the following conclusions respecting the technique for: (a) producing pork to be consumed fresh. The pigs should be slaughtered at the age of 6 to 9 months. They should be intensively fed, no change being made in

their diet at the time of weaning, so that they may develop as rapidly as possible. The ration must have a nutritive ratio of between I : 4 and I : 5, the best foods being cereal "grains," manioc, artichokes and skim-milk; (b) for producing salt pork: In order that this may be remunerative only cheap foods must be used, grain offal, residues, household scrap, etc. Store pigs from 6-8 months old which are vigorous and thrifty make the best use of such foods. If they are fed for the three months before they are killed upon foods that will improve the quality of their meat, they can be sold profitably, provided their weight does not exceed 220 lbs.

232.—Composition and Nutritive Value of Green Forage Silage.—HANSSON, NILS. *Kungl Landbruks Akademiens Handlingar och Tidskrift*, No. 5, pp. 413-434. Stockholm, 1922.

The experiments with forage crops described in this publication in addition to the results noted in the *Comptes Rendus de l'Institut Central de recherches agricoles* (No. 221) have led to the following conclusions:

(1) Leguminous forage crops and hay if silaged carefully, form a valuable feed for milch cows.

The most satisfactory results have been obtained with fresh green silage consisting of 30 to 50 per cent leguminous plants, cut when well matured, *i.e.*, when the pods are fully developed.

The forage should be well chopped up and stacked in such a way as to allow free circulation of air. The damping of forage which contains a large amount of dry matter, owing to undue desiccation, and the watering of the upper layers in the silo, helps to exclude the air and encourages good fermentation.

(3) The composition of the silage remains unchanged before and after ensilage. However, owing to moisture evaporation, the content of dry matter increases and certain modifications take place in the composition of the nitrogenous and fatty content (ether extracts).

A large proportion of the albuminoids are transformed into peptones and amino acids, and owing to their solubility, finally become changed into amides, retaining however, their former value as albuminoids. Even in cases where fermentation took place under the best conditions, about 10 to 20 per cent of the total nitrogen content of the forage was transformed into ammonia and was consequently lost.

During fermentation in the silo, the sugar and the carbohydrates gave rise to considerable quantities of organic acids, partly fatty acids, lacking however the nutritive value of fats. Certain samples of silaged feed considered as quite satisfactory, possessed on analysis up to 1 per cent free acids. On the other hand the presence of butyric acid indicates a badly made silage.

(4) Green silage has a favourable influence on milk production; the effect on the fatty content of milk may be compared with that of neutral forages.

(5) When the silage is well made, 14·3 lb. of silage consisting of 30 to 50 per cent leguminosae, or 15·4 to 16·5 lb. of hay corresponds to 1 food unit.

These two feeds contain 1·75 to 1·80 gm. of dry matter. These figures should be higher in the case of oats and barley silage, or if the silage has not been made successfully.

(6) For milch cows, the fresh silage forms an excellent winter feed and may be used to substitute fresh fodder, at the rate of 33, 44 or 55 lb. or more per cow per day. Thanks to the high content of dry matter this may also serve to a certain extent to replace straw. Green silage, well turned, contains 3 to 5 times more albumin than the roots of forage crops.

(7) Green silage has a dietetic value and has a slight laxative effect.

(8) Certain inconveniences are however associated with cheese making, more especially in cases where full ripening is necessary. The cheeses made with milk from cows fed on silage often ferment to excess and exude a large amount of gas.

262.—Turkey Breeding in Missouri (U.S.A.)—MCMAHAN, J. C., *Monthly Bulletin of the Missouri Board of Agriculture*, Vol. 20, No. 9, p. 19. Jefferson City, 1922.

The author gives some advice, based on his own experience on the subject of turkey-breeding. Ten acres of land are enough for one pair of turkeys; 4 turkey-hens and one turkey-cock can be kept on 15 acres and 8 turkey-hens and one turkey-cock on 20 acres. Fifteen turkey-hens can be allowed to run with one cock, but it is better to limit the number of females to 12. Turkeys should not be shut up, all they need is a shelter in which to take refuge in bad weather. The author used sodium chloride as a remedy against fleas in the birds, but if the parasites are very numerous, it is not sufficiently strong; recourse must be had in such case to the following mixture: carbolic acid, 1 oz., coal oil, 5 pints, tar oil, 10 oz. This mixture is to be applied, after thorough shaking, to the inside of a box sufficiently large to contain a turkey-hen. One turkey-hen is then put in, and the box covered with a sack. The sack can be removed after 20 minutes when it will be full of insects, while all those remaining on the bird will be killed. Turkey chicks cannot be treated in a similar way.

Turkey-hens lay on an average 17 to 20 eggs, but by good feeding, the number can be increased to 25.

The eggs should be collected twice a day at the beginning of the season, by a person with clean hands. The author does not advise that the collector should wear gloves. The eggs are kept in a basket and should be turned once every two days.

Turkey-hens must have a varied diet if they are to lay well. If no green food is available, they may be fed lucerne meal, or ground clover meal, soaked over night. In order to have yolks of good colour, green food is absolutely necessary. The author attached much importance to the use of bran, oat meal and wood charcoal which should be given *ad. lib.* to the birds in addition to their daily ration. Charcoal purifies the blood and keeps the liver in good condition. Hot food is not necessary, but if water is added to the ration, it should be warmed.

The turkey-hen begins laying at the end of February, or early in March. In order not to lose the eggs, it is well to affix a small bell to the bird's neck, and then it can be tracked easily to its nesting place. It is advisable to notice what attracts turkeys that prefer laying outside the poultry-yard.

When many birds are kept, a shed should be built for them. The author's turkey-house is 14 ft. long with boarding 4 ft. high at the ends and wire-netting 7 ft. 6 in. high in front. The shed is divided by movable partitions that can be replaced in bad weather by perches.

When it is impossible for a turkey-hen to sit where she has laid her eggs, the author makes a nest for her in a barrel. Before putting the bird on the nest, it is best to fumigate it and powder it over with insecticide. After a week the turkey-hen should be again examined for parasites as they attach themselves readily to the chicks.

The sitting turkey-hen should have always at its disposal some oatmeal, charcoal and water. Once a day a little maize is fed.

When a turkey-hen becomes broody, she is put on twenty eggs in a nest, and at the same time, a setting of nine eggs each is placed under nine young turkey-hens. As soon as the eggs have all hatched, the chicks are given to the old turkey-hen. When the young birds leave the nest, they are treated with insecticide, and during the first thirty-six hours are given only a little sour milk to drink. The hen on the contrary, is fed liberally, and is allowed plenty of pure water. The first food given to the young turkeys consists of hard-boiled eggs which are fed every three hours for the first four days, being gradually replaced by crushed oats and prepared foods. The chicks must not be let out in the morning before the dew has disappeared, and if they are caught in shower, must be put into a basket, covered with a cloth or sack, and put to dry near the fire. If any of the birds have caught cold, a little permanganate of potassium is added to their drinking water till they have recovered. Chicks attacked by diphtheria (*epitheliosis infectiosa avicum*) are treated as follows: A mixture is made of 2 oz. petroleum + 2 oz. sweet oil + 2 oz. turpentine + 2 oz. extract of camphor; this is well shaken and injected into the nostrils and upper part of the beak. This remedy is more effective if the bird's head is dipped first into warm salt water.

The author believes that the disease known as Black-Head is produced by the consumption of spilt or fermented food, and that it might be prevented by giving the birds wood-charcoal *ad lib.* At the beginning of the breeding season, the turkey-cocks should be given, in addition to their ordinary food, some maize-bread made according to the following recipe: 4½ litres of raw flour + one tablespoonful soda + 2 tablespoonfuls salt + 4 eggs. This is mixed with milk, put into a frying pan, and afterwards into a hot oven.

AGRICULTURAL INDUSTRIES

116.—Loss in the Grain of Maize in Storage as Silage.—Gaines, W. L., *Journal of Dairy Science*, Vol. V, No. 5, pp. 507-509. Baltimore, 1922.

The grain constitutes two-thirds of the nutritive value of the crop and practically its entire commercial value. It is therefore of practical interest to note that maize harvested as silage is associated with the better use of the stalk for feeding purposes.

The loss of dry matter in the grain, harvested and stored in crib and silo during these experiments, which covered a period of eight months, is estimated at 2·25 and 5·08 per cent respectively.

127.—Methods of Measuring the Volume of Cream on Milk.—Harding, H. A., Kelly, F. W., and Chrisler, E. S., *Journal of Dairy Science*, Vol. V, No. 5, pp. 468-478, bibliography. Baltimore, 1922.

In the city trade the appearance and volume of the cream on the milk as delivered to the consumer is a matter of considerable commercial importance. This has been recognized by the milk industry and different methods of measuring the cream have been adopted. There is however an almost complete lack of literature on the subject. The authors have made a study of the various methods, and finding that they were not satisfactory for the study of the influence of plant operations on the volume of cream, there has been developed a simple and accurate method of measurement which has been found readily applicable under working conditions.

This method consists in filling round bottomed test tubes 1 inch in diameter, to a depth of 204 mm. with the milk to be tested. The tubes are cooled immediately in ice water and then kept in a temperature of 40°F. for approximately 20 hours. The depth of the cream layer is measured in millimetres and each millimetre of cream represents 0·5 per cent of cream by volume. The volume of cream as determined in this way, agrees closely with the volume of cream in milk bottles under similar temperature conditions.

This method has been extensively tested in milk plants and its advantage lies in the fact that by its use a large number of samples may be collected during a single day, the samples stored compactly, and measurement of the cream made quickly, accurately and quantitatively.

128.—Preliminary Investigations on the Acid Content of Milk on the Composition of Butter and on the Oily Taste of Butter.—HAGLUND, E., and Waller, R., *Kunge Landtbruks-Akademiens Handlingar och Tidskrift*, Year LXI, pp. 425-456. 1922.

Towards the end of 1919, the Swedish Bureau of Butter Control reported to the Central Institute for Agricultural Research (Dairy Section) that the butter during the war was of inferior quality and suggested that a special study should be made as to the cause of oiliness, a defect which reduces to a marked degree the value of the butter.

Previous researches have shown that the oiliness was only noticeable in conjunction with sodium chloride and lactic acid. As regards the latter, experiments have demonstrated that this defect occurs only when the acidity of the cream is below 1·3 per cent. The butter content in non-fatty materials and the methods employed in butter making are both important factors in this respect.

The preliminary tests made during 1920-21, with a view to the modification of butter making methods, by artificial fermentation to prevent this unpleasant oiliness has led to the following conclusions:

(1) That in the dairies, the cream should only be churned when the acidity amounts to about 35° Soxhlet-Henkel in the non-fatty portions;

(2) That the churning continue until a very low acidity is reached, giving a butter with the characteristic flavour of artificial fermentation;

(3) That a lowering of acid content of cream improves to a large extent the keeping qualities of the butter.

(4) That the oily flavour of artificially fermented butter may be reduced if the acidity of the cream is also limited.

The experiments also indicate:

(1) That by increasing the degree of acidity of the cream, the non-fatty content of the butter is also lessened and the acidity of the brine is increased;

(2) That by adding equal quantities of lactic acid to the non-fatty portions of creams varying in fat content, the influence on the composition of the butter is nil;

(3) That the careful washing of the butter decreases the non-fatty content and the acidity of the brine;

(4) That if after the butter is washed, it is left in water for two hours, the acidity of the brine is still further decreased.

130.—Actinomyces in Milk With Special Reference to the Production of Undesirable Odours and Flavors.—FELLERS, C. R., *Journal of Dairy Science*, Vol. V, No. 5, pp. 485-497. Baltimore, 1922.

Actinomyces are often present in commercial milk samples. In normal samples these organisms constitute about 2·5 per cent of the total. In abnormal samples, particularly those drawn from cows in dusty stables, this figure may reach 50 per cent.

The principal sources of contamination are hay, straw, grain and soil and dust from these materials.

Under certain conditions actinomyces may cause an obnoxious, bitter-mouldy taste in milk after a few hours of storage.

The two most active species identified were *A. griseus* and *A. albus*. These organisms grow readily in milk and are able to produce marked changes in the casein and whey. The extremely diffusible and volatile substance which causes the odour and taste so characteristic of actinomyces is not known.

Actinomyces may cause stale, musty and mouldy odours in such foods as walnuts, dried fish, cereal grains, and possibly dried eggs. They occur in conjunction with moulds in various food-stuffs, especially those in dried condition.

In studying actinomyces or in attempting to isolate them, the ordinary methods and media with incubation at 37° C, are unsatisfactory; synthetic media should be used together with a long period of incubation at a low temperature.

PLANT DISEASES

308.—Review of the Literature Dealing With "Stipplestreak" and Other Kindred Diseases of the Potato. ATANASOFF, D. A. A., *Medeelingen van de Landbouwhoogeschool en van de daaraan verbonden Institute.* Vol. 26, Part I, pp. 1-52. Wageningen, 1922.

These bibliographical investigations on the diseases of the potato were undertaken

with the object of discovering whether the disease known under the name of "streak," or "stipplestreak" was a new malady.

As a result of his studies, the author reached the conclusion that though stipplestreak has been regarded as a disease of recent origin, it is on the contrary one of the oldest, if not quite the oldest, of the diseases attacking the potato. Further, it is clear that all the modern ideas of a relationship existing between "leafroll," "mosaic" and the maladies formerly called "curl," "Krauselkranheit" and "frisolee" are wholly without foundation, while less time would have been expended on the study of the nature of the affection known as "degeneration" or "running out," if the older literature on the subject had received more careful attention.

In the present review the author has made a concise summary of all that has been published regarding this group of diseases from 1775, the year when this form of degeneration, which still attacks the potato plant in Britain and on the continent of Europe, first began to attract notice. The review mentions some 140 works, and is divided into two periods, one dating from 1775 to 1900, and the other from 1901 to 1922; the first period being treated more exhaustively, as it contains less well-known, or forgotten publications of special interest.

313.—New Measure for Controlling Apple-Tree Canker (Nectria Ditissima).—MACINEIRA, F., *El Cultivador Noderno*, Year XII, No. 5, pp. 11-12. Barcelona, 1922.

On an estate situated on the north coast of Spain in the immediate neighbourhood of Cape Estaca de Bares (Galicia), at the mouth of the Sor, many of the most vigorous apple-trees belonging to the choicest varieties, as soon as they are 4-8 years old became seriously and in some cases fatally, attacked by canker (*Nectria ditissima* Tirl.).

The hardy Galician and Russian varieties, on the other hand, not only proved very resistant to the disease, but if they were attacked suffered less; none of the trees, or any large number of the branches, being killed. Therefore it would appear that the best method of protection against canker is to grow only varieties of apple which are least susceptible to the malady.

Since canker made its appearance, various measures have been adopted to save the infected trees.

The cankerous part of the bark of the trunk and main branches were cut away, the wounds being carefully scraped and then disinfected with 50 per cent "zotal," after which the trees were thoroughly pruned.

The trees in which the disease was in the initial stage were sprayed with 15 per cent Bordeaux mixture, after the infected portions and all dead tissue beneath them had been removed, and the wounds were subsequently disinfected.

Spraying with petroleum and "zotal" was also tried, but none of these treatments gave entirely satisfactory and lasting results.

At the beginning of 1918 an experiment of quite another kind was made. Three vigorous apple-trees of five or six years of age, which had been severely attacked by canker were chosen. Their large lower branches were cut away near the base, the cut being made in an horizontal direction, and the surface was scooped out with a gouge, so as to form a small groove at the end of the mutilated branch. A little copper sulphate (the exact amount was not noted) was dissolved in about half a litre of water and poured into the groove which was then covered over with a piece of canvas tied on with string; a further quantity of the solution was added every eight to ten days to replace the amount absorbed by the tissues. In addition, the large wounds on the trunk and on the remaining branches were treated, all the dead portions excised, and the cuts brushed over with very strong Bordeaux mixture. This first attempt was crowned with success. The old canker sores did not extend any further, and five years after the operation there was no sign of the reappearance of the disease, the trees producing a heavy crop of excellent fruits.

This experiment with some modifications was repeated in 1921, on five other apple-trees seriously attacked by canker. In the trunk of each of them a hole of small diameter and with a slope of about eighty degrees, was bored by means of a gimlet and gouge at a height of one to one and a half metres from the ground. Then a little cup was made with grafting-clay at the entrance of the hole. From March 12 to April 27, a solution of 200 gm. of copper sulphate in 2 litres of water was gradually introduced through the cup into the cavity, more being gradually added as it was absorbed by the tree, and the hole carefully covered with a piece of canvas. The trees were thoroughly pruned and all their canker wounds treated.

Four or five months after this operation a narrow longitudinal lesion appeared in the bark, and the latter became dry from the site of the perforation almost to the level of the ground. This lesion was probably caused by the strong concentration of the solution injected. Perhaps it would be advisable to use a 4 per cent or even weaker solution, instead of the 10 per cent solution. Apart from the above-mentioned cortical lesion, three of the trees have so far remained healthy and bear vigorous shoots and fine crops of apples. The fourth tree produces less strong shoots, while the fifth which was very sickly at the time of the experiment, although it developed no lesion of the cortex, has withered in consequence of root-rot.

A simple and effective means of combating canker is to make an incision down the

trunk in the spring and along the chief branches, on the most sheltered side of the strongest-growing apple-trees, as these are the most susceptible to canker. Trees thus treated are less likely to be infected with canker, or even if the disease attacks them, it assumes a mild form, while the young shoots of diseased trees which have been incised grow very strong and remain perfectly healthy.

It has been found that the best substance to apply to all wounds on fruit-trees, and especially those due to apple-canker, is a thick-paste made of crude sardine-oil (from the pickling-factories) mixed with powdered ferric oxide. This must be applied with a brush and trowel after the wounds have been cleaned and freed from all remains of cankerous growth.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

Agricultural Education in Norway.—BJANES, O. T., in *International Review of the Science and Practice of Agriculture*, January-March, 1923, pp. 1-12.

The Bacteriology of Agricultural Soil and Its Difficulties and Fallacies.—ROSSI, G., in *International Review of the Science and Practice of Agriculture*, January-March, 1923, pp. 13-23.

New Forms in the First Generation of Animals.—FRATEUR, J. L., Director Zootechnical Institute, Louvain, Belgium, in *International Review of the Science and Practice of Agriculture*, January-March, 1923, pp. 43-48.

Agricultural Technique and Farm Engineering in Germany.—NUSSBAUM, S., in *International Review of the Science and Practice of Agriculture*, January-March, 1923, pp. 49-60.

1.—The Weather and Crops in Eastern England, 1885-1921.—HOOKER, R. H., in *The Quarterly Journal of the Royal Meteorological Society*, Vol. XLVIII, No. 202, pp. 115-138. London, 1922.

10.—The Value of the Waste Lime From the Cellulose Industry for the Fertilization and Improvement of the Soil.—VON FEILITZEN, H. J., *Kungl. Landtbruks-Akademiens Handlingar och Tidskrift*, Year 71, No. 7, pp. 567-587. Stockholm, 1922.

11.—The Effects of Acids and of Alkaline Fertilizers.—HUDIG, J., and MEYER, C., in *Verslagen van landbouwkundigeson derzoekingen der Rijkslandbouw proefstations*, No. XXVI, pp. 60-86. Gravenhage, 1922.

29.—Effect of Cupric Treatments on the Wheat Yield.—MORETTINI, A., *Le Stazioni sperimentali agrarie italiane*, Vol. LV, Pts. 7-8-9, pp. 265-277. Modena, 1922.

30.—Potential Wheat Production Lost in the United States.—*Weather, Crops and Markets*, Vol. II, No. 24, pp. 497-507. Washington, D.C., 1922.

35.—Cereals Grown in Combination for Grain Production.—ZAVITZ, C. A., *Journal of the American Society of Agronomy*, Vol. 14, No. 6, pp. 225-228. Geneva, N.Y., 1922.

39.—Selection of Fibre Flax in the United States.—I. MILES, F.C., *United States Department of Agriculture, Farmer's Bulletin* 669, pp. 16. Washington, D.C., 1922 (revised). II. DAVIS, R. L., *United States Department of Agriculture, Bulletin* No. 1092, pp. 23. Washington, D.C., 1922.

52.—Factors Influencing the Profitable Production of Tomatoes for the Early Market and Canning Factory, and Cost of Production.—JONES, H. A., *University of Maryland Agricultural Experiment Station Bulletin* No. 248, pp. 153-186. College Park, Md., 1922.

71.—Food Value of Cocoanut Cakes, Cocoanut Meal and Ground Linseed for Dairying.—HANSSON, N., in *Kungl. Landtbruks-Akademiens, Handlingar och Tidskrift*, No. 6, pp. 497-519. Stockholm, 1922.

79.—The Richness of Jersey Milk.—*Live Stock Journal*, Vol. XCVI, No. 2598, p. 512. London, 1922.

88.—The Expediency of Introducing Rainbow Trout Into the Public Waters in Switzerland.—VOGLIA, M., *Bulletin suise de peche et de pisciculture*, Year 23, No. 3, pp. 35-37; No. 4, pp. 53-55; No. 5, pp. 74-76. Neuchatel, 1922.

110.—Automatic Uncoupling Apparatus for Tractors.—DESSAISAIX, P., *Journal d'Agriculture Pratique*, Year 86, No. 50, pp. 500-502. Paris, December 1922.

111.—Electric Windlass With Speed-Reducing Anchoring Pole.—SOURRISSEAU, T. H., *Journal d'Agriculture pratique*, Vol. 38, No. 46, pp. 418-421; *Ibidem*, No. 47, pp. 438-440. November, 1922; *Ibidem*, No. 48, pp. 459-461. December, 1922.

120.—Investigations Into the Cause of Waste of Exported Citrus Fruits in South Africa and the Best Methods of Storing, Packing and Transport.—THOMSON, M. R. H., PUTTERILL, V. A., and HOBSON, G., in *Union of South Africa Department of Agriculture, Bulletin* No. 1, pp. 1-69. Pretoria, 1922.

129.—The Copper Content of Cow's Milk.—SUPPLEE, G. G., and BELLIS, B., *Journal of Dairy Science*, Vol. V, No. 5, pp. 455-467. Baltimore, 1922.

140.—Experimental Tests With "Uspulun" and "Supersolfo" in the Control of Smut on Wheat.—Information provided by Professor Eriksson transmitted by Baron C. N. D. de Bildt, Delegate of Sweden at the International Institute of Agriculture.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief summary of the contents of the more important articles in the April-June number of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

New Legislation on Chambers of Agriculture in Germany.—11 pages. As a consequence of the political changes resulting from the war fresh legislation was introduced to bring about certain modifications in the Chambers of Agriculture already in existence in the States of Germany. This article gives the legislation in Prussia, Bavaria, Wurtemburg, Baden, Oldenburg, and Mechlenburg-Strelitz.

The Cultivation of Allotments in England and Wales During the War.—48 pages. The encouragement of allotments in England and Wales was an integral part of the food production campaign. It alleviated the labour difficulty which pressed so heavily on agriculture, since the work was done by allotment holders in their spare time. By intensive cultivation of land previously vacant, or at least less intensively cropped, allotment holders made a substantial addition to the food supply. The number of allotments increased during the war from 580,000 to 1,400,000. The present article deals with the origin and development of the allotment movement, the movement before the war, the methods by which land was provided, the war period, legislative measures, the work of the Food Production Department for the encouragement of allotment cultivation, war food societies, the work of children, cultivation of the land by British troops, and the results achieved.

Share Tenancy in Roumania.—16 pages. This article deals with the subject under the following heads: origin of share tenancy in Roumania; relation between peasants and landowners after the emancipation of the serfs; share tenancy under the law of 1908; the agrarian reform of 1919 and its effects on share tenancy; share tenancy in 1922.

Land Settlement in the Argentine Republic.—23 pages. Land settlement in the Argentine Republic is among the factors mainly instrumental in bringing about the rapid transformation of the earlier and poverty-stricken Vice-Regency into the wealthy agricultural and stockbreeding country of to-day. The present article gives a history of land settlement in Argentina, a summary of the legislation on the subject and its effects, an account of the work of the railways, and of the present situation with regard to land settlement.

Land settlement as carried out to-day in the cultivable lands that are State property has no longer the character of settlement initiated, encouraged and supported by the Government, but is rather colonization of a less regular kind, tolerated in the first instance and afterwards legalized by the Government, taking the form of subdivision of land previously cultivated and its grant on liberal terms to its cultivator or occupier.

The process of forming these settlements is as follows: When public cultivable lands become capable of economic use by the. construction of roads and railways which afford means of disposing of their products, they are at once taken up by squatters (*intrusos*), who settle in such a way as not to interfere with one another and so carry out the subdivision that each one holds a lot of 100 hectares (250 acres). The settlements being thus formed, the occupiers till

the land and introduce capital in the form of fixtures and improvements such as houses and outbuildings, wire netting, wells, etc. In these circumstances it becomes essential to the progress of the new colony and of the country at large that the Government should legalize the position of these squatters by arranging for the official creation of the colony and by granting the lots to their respective occupants. It is in this way that there have been formed in the National Territories, more particularly in those of the North, the greater number of the agricultural colonies which exist to-day in full activity and production.

As moreover the population of the existing colonies is continually increasing and new immigrants arrive in the country, the process of settlement of the uncultivated public lands and the springing up of agricultural colonies is a permanent phenomenon which from time to time makes necessary a Government measure regularizing the situation.

Such a measure was the latest Decree of the Executive, dated 11 July, 1921, which in laying down provisions for the foundation of farm and pastoral colonies and townships within the total area of 18,895,000 acres, not only ordered the creation of these colonies but also conferred legal existence on and regularized the position of thousands of squatter settlers who by their work have transformed the desert into rich zones of agricultural production.

Measures Taken to Facilitate Agricultural Co-operation in the United States.—8 pages. The outstanding measure, during recent years, to facilitate agricultural co-operation in the United States is the Capper-Volstead Co-operative Marketing Law enacted in February 1922. It authorizes farmers and others engaged in the production of agricultural products to act together in associations for the purpose of marketing their products collectively in interstate and foreign commerce. The enactment of the law has furnished a new impetus to the co-operative movement.

The article gives an account of the Cotton Futures Act, the Warehouse Act 1916, the Federal Farm Loan System, etc., and concludes with a statement of the scope and extent of agricultural co-operation in the United States.

Other articles in the April-June number of the International Review of Agricultural Economics are: The Dairy Association of Austria; Agricultural Co-operative Credit in the French Colonies; the German Agricultural Co-operative Societies in 1921-22; the Development of the Raiffeisen Rural Banks in Switzerland; Proposals for the Provision of Additional Credit Facilities in Great Britain; the Progress of Home Colonization in France; the Organization of the Land Departments in Syria and Lebanon; and the Work of the British-Australasian Wool Realization Association.

CO-OPERATIVE LIVE STOCK SHIPPING ASSOCIATIONS IN THE UNITED STATES

(A summary of Farmers' Bulletin No. 1292, U. S. Department of Agriculture)

Although it has long been a common practice in the United States for neighbouring farmers to make joint arrangements for the shipping of their live stock by rail, the development of the organized co-operative live stock shipping movement was long delayed. The first live stock shipping association was formed in 1883; the second not until 1904. Even during the next ten years development was slow and was confined almost entirely to the States of Minnesota, Wisconsin, and Iowa. In 1917, however, a period of rapid development began; at the present time it is estimated that there are between 4,000 and 5,000 producers' organizations which undertake the co-operative shipping of live stock. The movement has made the greatest progress in the Corn Belt and Middle Western States.

In many cases producers' organizations formed for other purposes have undertaken the shipping of live stock for their members in addition to their other activities; but associations formed specially for live stock shipping usually confine themselves to that work. In some States, particularly in Ohio, "county-wide" associations have recently been formed. This type of organization embraces the county as a unit and is directed by a county manager.

The co-operative shipping of live stock enables small farmers, who would otherwise be unable, to send their stock to a central market for sale, and is of considerable benefit even to large farmers. Owing to the fact that the local demand for live stock is limited, the advantages of selling in a central market are very great; local prices, especially for stock of inferior quality, are appreciably lower than those ruling in the central markets. Shipping associations make arrangements for the sale of the stock as well as for the actual transportation; since the stock is handled in bulk the total marketing expenses per head are kept very low. Farmers are safeguarded against deaths or injury among their stock during transit by being entitled in such cases to compensation

from the association; a fund for this purpose is provided by the association by an assessment upon all live stock shipped by it. The usual amounts deducted are 2 to 3 cents per 100 pounds weight on cattle and 3 to 4 cents per 100 pounds weight on hogs, sheep, and calves. The most equitable method is to deduct a certain percentage of the net proceeds.

Co-operative shipping facilities, moreover, enable a farmer to sell his stock at the most advantageous time both as regards the stock itself and the market. The stock can be sold in large or small quantities when it is in its most saleable condition and at a time when prices are good; otherwise when selling is delayed there is a great probability that either the stock or the market will suffer a decline. The most important advantage, however, which a producer derives from a co-operative live stock shipping association is the knowledge which he gains as to the needs of the market. He can compare the market prices of the different breeds or grades of stock and can determine the actual differences; he can then breed or fatten his stock accordingly. In this way the existence of a live stock shipping association has resulted in raising the standard of the live stock in whole districts.

A live stock shipping association may be formed with or without capital stock. The non-stock form of organization is usually the more desirable though this form cannot be adopted in those States where provisions have not been made for the incorporation of such associations. It is advisable for all organizations to be incorporated, since incorporation gives them a distinct legal status which cannot be otherwise obtained and, further, frees the members from liability for the debts of the association.

Very little capital is required for the working of a shipping association; an association ought never to buy or speculate in live stock or to make payment for the animals shipped until the proceeds from their sale have been received. In the case of non-stock associations a small membership fee is sufficient to provide for any necessary initial expense. If the association is formed with capital stock the share value need not be very great; the possession of a large amount of capital may, in fact, be disadvantageous by causing the association to depart from co-operative methods. Usually no surplus fund is accumulated, but where there may be a surplus it can be divided among the members in proportion to the amount of stock shipped by each through the association.

A president and board of directors, usually about seven in number, are appointed from among the members to control the general management of the association. A manager is appointed to take charge of the actual work. Since the success of a live stock shipping association depends to a great extent upon the manager it is imperative that the manager possess a thorough knowledge of business principles and methods as well as of live stock production and marketing. Further, he must possess the confidence of the farmers and must grasp the spirit of co-operation. The manager makes all arrangements necessary for the marketing of the live stock of the members. He orders the railway cars necessary for the stock and is present at the loading to receive, mark, and weigh the animals, and to see that they are properly loaded. The manager determines the market and the commission firm to which the stock is consigned.

The two general methods of selling stock, shipped co-operatively, in a central market are according to individual ownership and according to grade. The advantage of the former is that each farmer receives the exact value of his stock on the day of sale, but on the other hand an extra commission charge is made owing to the increased handling required by the stock at the market. An efficient system of selling stock by grade, however, also insures correct returns being made to each owner, and at the same time avoids the extra expense of sorting the stock and the loss of weight of the stock caused by such sorting. Further, in some markets dealers buying stock for immediate re-shipment to centres further East prefer to buy stock in bulk.

The prorating, or apportioning, of expenses, on co-operative shipments is done either by the commission firm selling the stock or, more desirably, by the manager. A specified rate per 100 lbs. weight or per car of stock is deducted from each shipment to cover the manager's commission and the various expenses, and to provide the protection fund. The manager is usually paid according to the amount of stock shipped instead of receiving a fixed salary. His commission varies among different associations from 4 to 10 cents per 100 pounds weight of stock shipped; some associations, however, pay him a specified amount per car. The manager receives from the commission firm the proceeds from the sale of the stock; after deducting expenses he distributes it to the individual members concerned.

In a movement so extensive as the co-operative live stock shipping movement some failures are inevitable. Failures are due not to any defects in the system but to defects in the working of individual associations. The chief causes of failure are incompetence on the part of the manager, and disloyalty on the part of the members or failure to give the association their full support. In many instances members of a shipping association are unwilling to allow a manager a fair compensation for his services; in consequence managers of inferior ability

only can be obtained and the business of the association accordingly suffers. The desire of certain members to obtain the manager's position has frequently caused the break-up of an association. In some cases associations have failed because they have been organized in districts where existing local marketing facilities were adequate and satisfactory. There have also been instances where the interests of live stock shipping associations have suffered as a result of the association being used to strengthen or develop other organizations.

The extensive development of the co-operative live stock shipping movement during the last few years shows that the advantages of the system are being more and more appreciated by farmers. As a result of the movement the quality of the live stock of United States no less than the facilities for marketing the stock will be considerably improved.

AGRICULTURAL STATISTICS

THE WORLD'S CEREAL CROPS OF 1923

OCTOBER 18, 1923

Since our communication published in the September-October number of the Agricultural Gazette at page 484, the International Institute has received important additional data or modifications of data previously published, and we are enabled to give in nearly all cases official estimates instead of estimates calculated from acreage and condition of crops. There are presented below official returns to date for the five cereals and potatoes.

In the last issue there appeared a forecast of the total production of wheat in Europe showing an increase of 178,000,000 bushels over last year. The official figures have now been received from all the countries of Europe except Scotland, Ireland, Denmark and Austria, and they show an increase of 219,000,000 bushels over last year's crop and 33,000,000 over that of 1921. Europe's total production is now given as 1,258,000,000 bushels compared with 1,039,000,000 in 1922 and 1,225,000,000 in 1921.

On account of the huge crop in Canada, in spite of the decrease of over 80,000,000 bushels in the crop of the United States the total production in North America is 1,252,000,000 bushels against 1,262,000,000 last year.

A cablegram received from the International Institute to-day (October 18) states that the first official estimate of the wheat crop of Argentina to be harvested in December is 248,755,000 bushels compared with 189,047,000 last year, and 180,642,000 in 1921. It may be mentioned in this connection that the first estimate of Argentina's crop last year was 26,000,000 bushels more than the final estimate.

With official estimates received from all but a few countries the world's production of wheat in 1923 is now given as 3,422,000,000 bushels against 3,108,000,000 in 1922, and 3,087,000,000 in 1921, an increase over last year of 314,000,000 bushels and over 1921 of 335,000,000.

Wheat Demand and Requirements

As shown in the table on page 594 there is a decrease of 331,000,000 bushels or 17.6 per cent in Europe's potato crop, with Germany yet to be heard from, and in view of Germany's recent order prohibiting the export of potatoes the crop in that country must be short. This shortage of potatoes, coupled with the fact that there has been a protracted drought in southeastern Europe severely cutting down the areas seeded to the new crop, make it practically certain that Europe will import more wheat this year than was at first expected.

In Jugoslavia and Bulgaria the weather is dry and soil conditions are unfavourable for seeding. In Hungary seeding is proceeding with difficulty on account of the hardness of the soil, and in Sweden the present wheat harvest has turned out much below expectations owing to heavy rains.

These facts make it necessary to revise the table given at page 486 of the September-October Agricultural Gazette showing the prospective imports of wheat and flour in the present grain year. The detailed statement of probable imports is now as follows:

	Million bushels
Great Britain	220
Germany	60
France	40
Italy	85
Belgium	40
Denmark	5
Sweden	13
Norway	7
Netherlands	27
Finland	5
Greece	13
Switzerland	16
Austria	13
Czechoslovakia	5
Spain	8
Portugal	5
Total for Europe	562
Ex Europe	120
Grand Total	682

The supply situation is considerably changed on account of the new large estimates for Canada and Argentina. But there are several factors more favourable to the seller of wheat. The crop of India has turned out to be of poor quality. In south-eastern Europe the long drought endangering the next crops will likely decrease the amount of exports from the Balkans. Russia is exporting very little wheat, and nothing near as much as some experts predicted. The following statement of prospective exports during this grain year is based on the changed situation.

	Million bushels
Canada	300
United States	140
Argentina	150
Australia	50
India	20
Balkans	18
Russia	15
North Africa	7
Total	700

If these exports are realized they will just about supply the demand of 682,000,000 bushels as estimated in the table for imports.

At page 591 tables are given showing the detailed official figures for the imports and exports of wheat and flour during the grain years 1921-22 and 1922-23.

WORLD'S PRODUCTION OF WHEAT.

Countries	1923	1922	1921
	Bushels	Bushels	Bushels
Europe:			
Great Britain and Ireland	61,000,000	65,249,000	73,795,000
France	290,477,000	243,317,000	323,470,000
Germany	101,472,000	71,934,000	107,824,000
Belgium	12,589,000	10,615,000	14,495,000
Netherlands	6,678,000	6,063,000	8,425,000
Denmark	11,000,000(a)	9,249,000	11,145,000
Norway	569,000	643,000	972,000
Sweden	9,862,000	9,381,000	12,577,000
Finland	515,000	296,000	280,000
Spain	152,388,000	125,470,000	145,151,000
Portugal	12,964,000	9,782,000	9,418,000
Italy	199,151,000	161,643,000	192,838,000
Switzerland	5,453,000	3,571,000	5,284,000
Luxemburg	522,000	173,000	661,000
Poland	53,381,000	42,451,000	37,410,000
Czechoslovakia	36,537,000	33,621,000	38,382,000
Austria	7,500,000 (a)	7,422,000	6,530,000
Hungary	66,418,000	54,729,000	52,716,000
Jugoslavia	61,894,000	44,472,000	51,810,000
Roumania	115,900,000	92,008,000	78,564,000
Bulgaria	38,783,000	37,705,000	42,510,000
Greece	13,356,000	9,553,000	11,170,000
Total Europe	1,258,409,000	1,039,347,000	1,225,427,000
North America:			
Canada	469,781,000	399,786,000	300,858,000
United States	781,737,000	862,000,000	814,905,000
Total North America	1,251,518,000	1,261,786,000	1,115,763,000
Asia:			
India	369,263,000	366,985,000	250,356,000
Japan	26,485,000	27,617,000	26,921,000
Total Asia	395,748,000	394,602,000	277,277,000

WORLD'S PRODUCTION OF WHEAT—*Concluded*

Countries	1923	1922	1921
	Bushels	Bushels	Bushels
AFRICA:			
Algeria	38,383,000	18,233,000	33,764,000
Egypt	40,304,000	36,648,000	37,011,000
Morocco	23,549,000	12,894,000	23,220,000
Tunis	9,406,000	3,674,000	10,623,000
South Africa	7,000,000(a)	6,696,000	8,689,000
Total Africa	118,642,000	78,145,000	113,307,000
SOUTH AMERICA:			
Argentina	248,755,000	189,047,000	180,642,000
Chili	23,000,000 (a)	23,815,000	22,179,000
Uruguay	8,000,000 (a)	5,152,000	9,944,000
Total South America	279,755,000	218,014,000	212,765,000
AUSTRALASIA:			
Australia	110,000,000 (a)	107,263,000	132,285,000
New Zealand	8,000,000 (a)	8,500,000	10,565,000
Total Australasia	118,000,000	115,763,000	142,850,000
WORLD'S TOTAL	3,422,072,000	3,107,657,000	3,087,389,000

(a) Estimates based on acreage and condition reports.

IMPORTS OF WHEAT AND FLOUR 1922-23 AND 1921-22

(Flour expressed in equivalent quantities of wheat)

Countries	August 1st, 1922, to July 31st, 1923			August 1st, 1921, to July 31st, 1922		
	Wheat	Flour	Total wheat and flour	Wheat	Flour	Total wheat and flour
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
Great Britain and Ireland	180,063,000	31,893,000	211,956,000	173,846,000	40,392,000	214,238,000
France	48,190,000	....	48,190,000	19,555,000	....	19,555,000
Italy	117,686,000	....	117,686,000	100,986,000	....	100,986,000
Belgium	40,510,000	....	40,510,000	45,048,000	....	45,048,000
Germany	34,877,000	3,143,000	38,020,000	69,426,000	1,251,000	70,677,000
Austria	3,965,000	9,021,000	12,986,000	10,530,000	8,210,000	18,740,000
Denmark	3,487,000 (a)	2,390,000 (a)	5,877,000	1,623,000	2,567,000	4,190,000
Greece	11,438,000	4,261,000	15,699,000	12,563,000	667,000	13,230,000
Norway	4,008,000	2,613,000	6,621,000	3,035,000	2,055,000	5,090,000
Netherlands	21,627,000	5,618,000	27,245,000	18,453,000	4,521,000	22,974,000
Sweden	8,440,000	1,029,000	9,469,000	3,715,000	831,000	4,546,000
Switzerland	16,017,000 (a)	....	16,017,000	13,217,000	....	13,217,000
Czechoslovakia	1,165,000	10,782,000	11,947,000	1,628,000	9,778,000	11,406,000
Japan	12,887,000	1,205,000	14,092,000	22,248,000	2,567,000	24,815,000
Egypt	58,000	7,404,000	7,462,000	205,000	6,718,000	6,923,000
Other countries	738,000	8,871,000	9,609,000	933,000	5,226,000	6,159,000
Totals	505,156,000	88,230,000	593,386,000	497,011,000	84,783,000	581,794,000
Exports from these countries	3,425,000	13,429,000	16,854,000	7,183,000	10,841,000	18,024,000

(a) 11 months.

EXPORTS OF WHEAT AND FLOUR 1922-23 AND 1921-22.

(Flour expressed in equivalent quantities of wheat.)

Countries.	August 1st, 1922, to July 31st, 1923			August 1st, 1921, to July 31st, 1922		
	Wheat	Flour	Total wheat and flour	Wheat	Flour	Total wheat and flour
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
Canada..........	229,850,000	49,514,000	279,364,000	150,936,000	34,834,000	185,770,000
United States....	148,966,000	66,864,000	215,830,000	198,434,000	70,053,000	268,487,000
Argentina........	135,438,000	3,791,000	139,229,000	113,706,000	4,273,000	117,979,000
Australia........	31,232,000	18,363,000	49,595,000	97,426,000	16,547,000	113,973,000
India............	26,320,000	2,542,000	28,862,000	445,000	2,383,000	2,828,000
Hungary..........	48,000	5,106,000	5,154,000	708,000	8,387,000	9,095,000
Roumania.......	275,000	1,320,000	1,595,000	2,977,000	517,000	3,494,000
Algeria..........	2,447,000	....	2,447,000	5,533,000	....	5,533,000
Tunis...........	918,000	....	918,000	1,815,000	....	1,815,000
Other countries...	....	1,958,000	1,958,000	....	806,000	806,000
Totals.......	575,494,000	149,458,000	724,952,000	571,980,000	137,800,000	709,780,000
Imports into these countries.	23,292,000	3,983,000	27,275,000	35,505,000	4,013,000	39,518,000

RYE, BARLEY, OATS, CORN AND POTATOES

Official estimates of the production of cereals other than wheat have now been received from nearly all the important producing countries of the northern hemisphere. A smaller number of reports have been received for potatoes, some important producers, such as Germany, having not yet furnished estimates. The following tables contain the detailed figures for 1923, 1922 and the average for the five years 1917-21.

Rye.—The total production this year for 25 countries is 924,000,000 against 812,000,000 last year, an increase of 112,000,000 bushels. There are increases in nearly every country of Europe, and especially large ones in Germany and Poland. Canada and the United States have decreases of 6,000,000 and 31,000,000 respectively.

Barley.—There is a grand total of 1,077,000,000 bushels against 940,000,000 in 1922, an increase of 137,000,000 bushels. There are considerable increases in Germany, Spain, Poland, Czechoslovakia, Canada and the United States, and North Africa. Roumania is the only country that shows an important decrease.

Oats.—Here again there is a large increase in the world's total, which is 3,379,000,000 bushels against 2,944,000,000 last year, an increase of 435,000,000 bushels. This large increase is made up mostly by the crops of Germany, France, Poland, Canada and the United States.

Corn.—Very few countries have furnished estimates of their corn crops so far. The European countries reporting show increases, and there is an increase of 131,000,000 bushels in the United States crop.

Potatoes.—This is the only crop that shows substantial decreases from last year, both in Europe and North America. The grand total for the countries so far reporting is 2,044,000,000 against 2,430,000,000 last year, a decrease of 386,000,000 bushels. There are large decreases in Belgium, England, the Netherlands, Poland and the United States.

RYE

Countries	1923	1922	Average 1917 to 1921
	Bushels	Bushels	Bushels
Germany	273 301 000	206 051 000	233 180 000
Belgium	19 538 000	18 284 000	17 982 000
Bulgaria	8 480 000	7 453 000	6 186 000
Spain	28 642 000	26 252 000	26 779 000
Esthonia	6 863 000	5 797 000	5 710 000
Jugoslavia	5 913 000	4 523 000	5 953 000
Finland	10 592 000	7 775 000	9 918 000
France	36 915 000	38 412 000	35 700 000
Greece	2 662 000	2 362 000	3 151 000
Hungary	31 762 000	25 148 000	21 856 000
Italy	6 693 000	5 563 000	5 675 000
Latvia	11 811 000	6 845 000	9 806 000
Lithuania	24 078 000	24 249 000	18 336 000
Luxemburg	409 000	250 000	360 000
Norway	840 000	862 000	955 000
Netherlands	15 393 000	16 884 000	14 387 000
Poland	257 579 000	197 394 000	175 860 000
Portugal	5 372 000	5 294 000	4 392 000
Roumania	10 322 000	9 206 000	9 263 000
Sweden	22 100 000	22 678 000	20 959 000
Switzerland	1 646 000	1 693 000	1 576 000
Czechoslovakia	51 813 000	51 098 000	43 338 000
Total Europe	832 721 000	684 073 000	671 322 000
Canada	26 936 000	32 373 000	11 066 000
United States	64 774 000	95 497 000	70 426 000
Algeria	17 000	4 000	5 000
GRAND TOTAL	924 451 000	811 947 000	52 819 000

Countries	1923	1922	Average 1917 to 1921
	Bushels	Bushels	Bushels
Germany	109 323 000	73 838 000	82 209 000
Belgium	4 223 000	3 138 000	4 306 000
Bulgaria	12 282 000	11 941 000	8 9[illegible]0 000
Spain	105 247 000	77 534 000	86 010 000
Esthonia	4 351 000	6 670 000	4 415 000
Jugoslavia	14 327 000	11 070 000	13 289 000
Finland	4 928 000	4 557 000	5 117 000
France	46 994 000	40 909 000	34 329 000
England and Wales	44 655 000	42 233 000	47 889 000
Hungary	24 196 000	22 170 000	21 540 000
Italy	10 105 000	8 254 000	9 0[illegible] 000
Lithuania	8 410 000	10 725 000	6 097 000
Luxemburg	129 000	177 000	111 000
Norway	3 849 000	4 483 000	4 916 000
Netherlands	2 922 000	3 196 000	2 683 000
Poland	81 966 000	59 559 000	58 151 000
Roumania	68 614 000	94 780 000	56 430 000
Sweden	12 212 000	13 830 000	11 828 000
Switzerland	570 000	482 000	631 000
Czechoslovakia	55 177 000	46 352 000	42 355 000
Total Europe	614 510 000	536 198 000	500 298 000
Canada	80 357 000	71 865 000	62 351 000
United States	199 251 000	186 118 000	186 854 000
Japan	81 369 000	87 138 000	92 073 000
Algeria	46 316 000	18 805 000	34 886 000
Egypt	11 376 000	11 306 000	11 189 000
Morocco	32 736 000	27 230 000	32 805 000
Tunis	11 482 000	1 837 000	8 102 000
GRAND TOTAL	1 077 397 000	940 497 000	928 558,000

OATS

Countries	1923	1922	Average 1917 to 1921
	Bushels	Bushels	Bushels
Germany	387,465,000	260,374,000	307,725,000
Belgium	34,217,000	33,667,000	30,259,000
Bulgaria	9,461,000	8,606,000	6,429,000
Spain	33,987,000	29,378,000	31,970,000
Esthonia	8,442,000	9,466,000	7,706,000
Jugoslavia	18,216,000	17,197,000	19,364,000
Finland	26,852,000	26,540,000	24,932,000
France	355,271,000	271,311,000	224,531,000
England and Wales	87,136,000	85,240,000	105,347,000
Hungary	23,855,000	21,227,000	20,834,000
Italy	34,366,000	28,673,000	33,701,000
Lithuania	25,165,000	27,240,000	14,962,000
Luxemburg	2,023,000	1,437,000	1,494,000
Norway	10,382,000	12,593,000	14,444,000
Netherlands	22,534,000	18,728,000	20,141,000
Poland	244,624,000	162,469,000	147,025,000
Roumania	55,956,000	86,658,000	63,392,000
Sweden	64,185,000	74,310,000	63,641,000
Switzerland	2,879,000	2,321,000	3,448,000
Czechoslovakia	81,193,000	67,344,000	62,938,000
Total Europe	1,528,209,000	1,244,779,000	1,204,283,000
Canada	531,378,000	491,239,000	436,130,000
United States	1,302,453,000	1,201,436,000	1,272,736,000
Algeria	12,323,000	5,243,000	12,818,000
Morocco	1,084,000	169,000	368,000
Tunis	3,112,000	746,000	3,197,000
GRAND TOTAL	3,378,559,000	2,943,612,000	2,929,532,000

Countries	1923	1922	Average 1917 to 1921
	Bushels	Bushels	Bushels
Bulgaria	22,007,000	15,479,000	18,616,000
Hungary	53,096,000	48,725,000	40,933,000
Switzerland	165,000	185,000	284,000
Czechoslovakia	10,455,000	9,884,000	9,539,000
Canada	16,376,000	13,798,000	13,629,000
United States	3,021,454,000	2,890,712,000	2,838,160,000
Algeria	275,000	276,000	268,000
Totals	3,123,828,000	2,979,059,000	2,921,429,000

Countries	1923	1922	Average 1917 to 1921
	Bushels	Bushels	Bushels
Belgium	88,852,000	144,454,000	86,126,000
Bulgaria	1,220,000	1,360,000	1,311,000
Esthonia	23,667,000	26,373,000	22,081,000
Finland	18,330,000	16,009,000	19,231,000
England and Wales	97,626,000	149,781,000	122,394,000
Hungary	62,361,000	48,491,000	61,022,000
Luxemburg	4,630,000	7,007,000	5,046,000
Norway	29,267,000	32,699,000	32,728,000
Netherlands	81,947,000	136,623,000	102,388,000
Poland	1,055,213,000	1,221,588,000	635,650,000(a)
Sweden	66,483,000	74,788,000	68,692,000
Switzerland	23,292,000	24,820,000	30,898,000
Total Europe	1,552,888,000	1,883,993,000	1,187,567,000
Canada	87,591,000	92,908,000	110,198,000
United States	401,424,000	451,185,000	381,876,000
Algeria	2,205,000	2,146,000	1,317,000
	2,044,108,000	2,430,232,000	1,680,958,000

(a) The year 1921.

INDEX NUMBERS OF THE PRICE OF WHEAT

Dates	Exporting Markets				Importing Markets					
	Canada Winnipeg — No. 1 Manitoba	*United States* Chicago — No. 2 Winter	*India* Karachi — Karachi white	*Argentina* Buen. Aires — Barletta	*Germany* Berlin — Home grown	*Belgium* Antwerp — Home grown (Markischer)	*France* Paris — Home grown	*Great Britain* London — Home grown	*Italy* Milan — Home grown soft	*Netherlands* Rotterdam — Home grown
Average 1913	100	100	100	100	100	100	100	100	100	100
12 September 1913	98·2	103·6	94·9	107·5	99	98·5	97·8	99·0	92·5	99·8
8 September 1922	117·9	115·5	150·2	137·0	28,724	277·8	275·6	111·5	419·9	95·1
6 July 1923	127·7	115·5	125·6	134·1	4,295,882	555·6	350·1	141·7	393·2	145·0
13 " "	122·2	112·6	121·5	132·9	5,998,983	555·6	349·6	141·7	359·4	137·8
20 " "	122·2	113·3	117·9	131·2	8,896,797	555·6	346·5	141·7	348·8	126·0
27 " "	122·9	108·9	114·6	126·6	19,827,148	479·8	335·7	146·9	341·6	128·3
3 August "	121·7	108·6	112·1	126·6	23,894,255	472,2	306,5	153,1	325,6	135,5
10 " "	123·9	111·4	108·0	128·3	52,364,006	472·2	304·7	127·1	318·5	135·5
17 " "	127·6	115·0	108·8	130·1	55,922,725	459·6	308·8	112·5	322·1	112·8
24 " "	138·5	117·3	113·8	133·5	87,697,001	454·5	308·8	115·6	327·4	118·8
31 " "	134·7	117·6	112·9	135·8	200,813.421	439·4	312·4	112·5	327·4	105·7
7 September "	132·4	122·4	117·0	137·0	559,227,250	444·4	320·5	117·7	323·8	....
14 " "	120·3	118·0	119·5	137·6	....	439·4	313·3	115·6	323·8	....

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

AT THE EXCHANGE OF THE DATES INDICATED

Products, Markets and Descriptions	7 Sept. 1923	3 Aug. 1923	1 Sept. 1922	Aver. 1913
WHEAT (*cents per 60 lbs.*)				
Canada:				
Winnipeg: No. 1 Manitoba	114	105	102	88
United States:				
Chicago: No. 2 Winter	110½	98	103⅜	90¼
Minneapolis: No. 1 North	122	112	107	87⅝
New York: No. 2 Winter	116	111½	116½	97¼
India:				
Karachi: Karachi white	99	96	125	91
Argentina:				
Buenos Aires: Barletta	105	101	117	100
Germany:				
Berlin: Home grown	—	116	95	128
Belgium:				
Antwerp: Home grown	109	117	n.q.	104
France:				
Paris: Home grown	135	134	160	146
Great Britain:				
London: English	114	150	107	104
Liv. and Lond.: No. 1 Man.	132	122	132	110
Liv. and Lond.: No. 2 Win.	117	113	118	109
Liv. and Lond.: Pacific	128	124	132	111
Liv. and Lond.: Plate	117	115	119	108
Liv. and Lond.: Australian	126	130	141	117
Liv. and Lond.: C. W. Kar.	116	116	n.q.	110
Italy:				
Milan: Home grown soft	106	108	139	148
Netherlands:				
Rotterdam: Home grown	—	152	114	115
RYE. (*cents per 56 lbs.*)				
United States:				
Minneapolis: No. 2	64	61	63¾	56⅝
Germany:				
Berlin: Home grown	—	67	72	101
Belgium:				
Antwerp: Home grown	75	76	94	80
France:				
Paris: Home grown	95	n.q.	102	97
Netherlands:				
Rotterdam: Home grown	—	80	89	86

Ocean Rates of Freight and Voyages	7 Sept. 1923	3 Aug. 1923	1 Sept. 1922	Aver. 1913
OCEAN RATES OF FREIGHT (WHEAT AND MAIZE) (*cents per 100 lbs.*)				
Rumania:				
Danube to U. K.	15	16	18	11
Danube to Genoa	13	n.q.	15	10
Canada:				
Canada to U. K.	12	13	14	14
United States:				
New York to Liverpool.	7	7	8	10
North. Range to U.K. Cont.	12	12	11	13
North. Range to Genoa.	15	n.q.	15	20
North Pacific Ports to U.K.	35	37	35	43
Argentina:				
Plate Down River-U.K.	20	20	20	18
Plate Up River-U.K.	21	22	21	20
India:				
Karachi to U.K.	23	25	20	20
Rangoon to U.K.	23	n.q.	22	29
Australia:				
Australia to U.K.	33	n. 33	35	34
COTTON FREIGHTS (*cents per 100 lbs.*)				
United States:				
New York to Liverpool.	20	20	35	30
New Orl. to Liverpool.	n.q.	n.q.	50	43

LIVE STOCK STATISTICS

ENGLAND AND WALES

Classification	Number		Increase(+)or decrease (−)	
	On June 4, 1923	On June 3, 1922	in number	per cent
Horses	1,281,200	1,340,500	− 59,300	− 4·4
Cattle	5,822,100	5,722,700	+ 99,400	+ 1·7
Sheep	13,831,800	13,438,000	− 393,800	− 2·9
Pigs	2,611,400	2,298,900	+ 312,500	+ 13·6

SPAIN

Classification	Number		Increase(+) or decrea (−)	
	in 1922	in 1921	in number	per cent
Cattle	3,296,573	3,718,189	− 421,616	− 11·3
Horses	594,351	722,183	− 127,832	− 17·7
Asses	1,014,026	1,137,980	− 123,954	− 10·9
Mules	1,069,408	1,294,912	− 225,504	− 17·4
Sheep	19,377,427	20,521,677	−1,144,250	− 5·6
Goats	3,970,656	4,298,056	− 327,400	− 7·6
Pigs	4,228,964	5,151,988	− 923,024	− 17·9
Camels	5,084	4,268	+ 816	+ 19·1

LATVIA

Classification	Number		Increase (+)or decrease (−)	
	Aug. 1923	June 1922	in number	per cent
Horses	338,000	303,000	+ 35,000	+ 11·4
Cattle	899,100	810,500	+ 88,600	+ 10·9
Sheep	1,460,800	1,166,500	+ 299,300	+ 25·8
Pigs	484,000	402,000	+ 82,000	+ 20·4

INDIA

Classification	Number		Increase(+) or decrease(−)	
	December, 1921, to April, 1922	December, 1920, to April, 1921	in number	per cent
Cattle	116,665,370	116,736,303	− 70,933	− 0·1
Horses and ponies	1,683,947	1,696,746	− 12,799	− 0·8
Asses	1,368,376	1,370,614	− 2,238	− 0·2
Mules	75,536	75,703	− 167	− 0·2
Sheep	22,084,579	22,074,566	+ 10,013	0·0
Goats	24,333,133	24,293,873	+ 39,260	+ 0·2
Buffaloes	28,334,899	28,366,767	− 31,868	− 0·1
Camels	409,674	409,612	+ 62	0·0

NEW ZEALAND

Classification	Number		Increase (+) or decrease(−	
	1923	1922	in number	per cent
Horses	331,922	332,105	− 183	− 0·1
Cattle	3,475,449	3,323,223	+ 152,226	+ 4·6
Sheep	22,928,864	22,222,259	+ 706,605	+ 3·2
Pigs	396,648	384,333	+ 12,315	+ 3·2

THE AGRICULTURAL GAZETTE OF CANADA

INDEX TO VOLUME X

PART I

DOMINION DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS BRANCH

DAIRY AND COLD STORAGE BRANCH

ENTOMOLOGICAL BRANCH

HEALTH OF ANIMALS BRANCH

LIVE STOCK BRANCH

SEED BRANCH

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

NOVA SCOTIA

NEW BRUNSWICK

ONTARIO

QUEBEC

MANITOBA

SASKATCHEWAN

ALBERTA

BRITISH COLUMBIA

PART III

SCHOOL AGRICULTURE AND RELATED ACTIVITIES

NOVA SCOTIA

NEW BRUNSWICK

ONTARIO

QUEBEC

MANITOBA

SASKATCHEWAN

ALBERTA

BRITISH COLUMBIA

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS PUBLICATIONS AND NOTES

PART V

INDEX TO FOREIGN AGRICULTURAL INTELLIGENCE

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. XI. SUPPLEMENT
MARCH-APRIL, 1924

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA

THE AGRICULTURAL GAZETTE OF CANADA

INDEX TO Nos. 1 AND 2, VOLUME XI, 1924

PART I

DOMINION DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS BRANCH

DAIRY AND COLD STORAGE BRANCH

ENTOMOLOGICAL BRANCH

HEALTH OF ANIMALS BRANCH

LIVE STOCK BRANCH

SEED BRANCH

PAGE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

QUEBEC

ONTARIO

SASKATCHEWAN

PART III

SCHOOL AGRICULTURE AND RELATED ACTIVITIES

NOVA SCOTIA

NEW BRUNSWICK

ONTARIO

MANITOBA

SASKATCHEWAN

ALBERTA

ANNOUNCEMENT

According to instructions given by the Minister of Agriculture, *The Agricultural Gazette of Canada* will cease publication with the present issue, namely, that of March-April, 1924.

Subscriptions for the unexpired portion of 1924 will be refunded.

J. B. SPENCER,
Director of Publicity

Publications Branch,
Department of Agriculture,
Ottawa, Canada.

BRITISH COLUMBIA

PART IV

PART V

INDEX TO FOREIGN AGRICULTURAL INTELLIGENCE

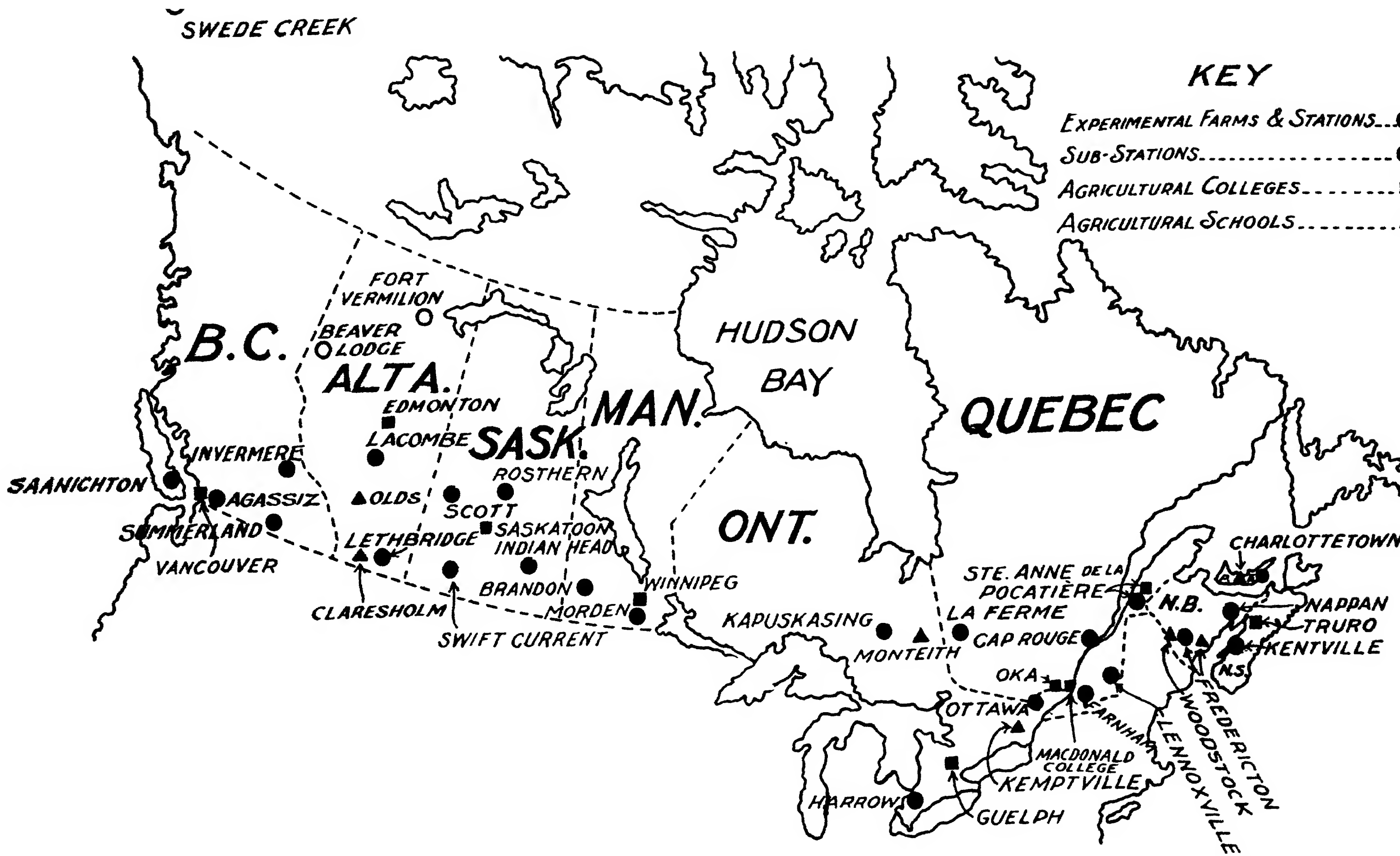
DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 11: No. 1 January-February, 1924

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA



MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART I

DOMINION DEPARTMENT OF AGRICULTURE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

PART III

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS, PUBLICATIONS AND NOTES

PART V

INTERNATIONAL INSTITUTE OF AGRICULTURE

The AGRICULTURAL GAZETTE
OF CANADA

VOL. XI | JANUARY-FEBRUARY, 1924 | No. 1

NATIONAL DAIRY SHOW

THE seventeenth National Dairy Show, held at Syracuse, N.Y., U.S.A., in October, 1923, is said to have comprised the greatest exhibit of dairy cattle ever gathered together in any country. In three out of the five leading dairy breeds, Canada had representation in every class. In the State Herd Competition, Canadian breeders of Holstein-Friesian, Jersey and Ayrshire cattle distinguished themselves by winning the coveted first place for each breed against all comers. In this competition ten animals from a state or province constitute a herd, not more than two animals being contributed by one breeder. In the Holstein-Friesian and Jersey herds the Province of Ontario won first, while the premier Ayrshire herd award went to the Province of Quebec.

To Canadian Holsteins goes the distinction of holding the State Herd championship, in addition to the official production championship.

The Jersey herd win constitutes the second for the Province of Ontario at this Show in the space of three years. With five states represented at Syracuse the order of the awards was, Ontario, Connecticut, New Jersey, Massachusetts and New York.

While the achievement in the herd competition was most noteworthy, Canadian breeders secured a creditable proportion of the awards in other classes with widely distributed winnings. These included the Holstein Junior Championship, and the Senior and Grand Championship in the female section for Ayrshires.

The achievement of Canadian dairy cattle at the National Dairy Show of 1923 is an outstanding one. It demonstrates that Canadian animals of the leading dairy breeds are among the best that this continent can produce. Those breeders who contributed to the result have done more than could be accomplished by any other means to secure recognition of this fact. They may well be proud of their efforts, and are to be congratulated on the successful outcome.

THE WORLD'S DAIRY CONGRESS

By J. A. RUDDICK, Dairy Commissioner

THE World's Dairy Congress, which was opened at Washington, D.C., on October 2nd, continued at Philadelphia, Pa., on October 4th, and concluded at Syracuse, N.Y., October 5-10th, was in reality the seventh of such events. The first six, known as International Dairy Congresses, were held in Europe under the auspices of the International Dairy Federation, with headquarters in Belgium. At the time this last congress was proposed, the Federation was not prepared to function; consequently the United States government agreed to assume the responsibility of organization and to invite the rest of the world to participate. Forty-three countries accepted the invitation and sent official delegates. Every important dairying country was represented except New Zealand. Some 800 delegates, foreign and American, registered at Washington, and many more at Philadelphia and Syracuse.

The two sessions in Washington were held in that fine auditorium known as Continental Hall. Secretary Hughes gave the address of welcome on behalf of the United States Government. Mr. Herbert Hoover spoke in the dual capacity of Secretary of Commerce and President of the American Child Health Association. He made a most emphatic pronouncement as to the value of milk and its products in the diet. Henry C. Wallace, Secretary of Agriculture, also addressed the delegates, and on the afternoon of October 3rd they were received and addressed by President Coolidge at the White House. Thus the industry and the programme of the Congress received full official recognition.

The other addresses at Washington were of general character, and were intended to form a sort of background for the more technical papers that were presented at Syracuse. The writer had the honour of being asked to give a paper at Washington on the "International Trade in Dairy Products."

An interesting function at Washington was the International Banquet, the chief feature of which was the roll call of the nations by Dr. C. W. Larsen, Chief of the Dairy Division. This afforded an opportunity for flag waving and playing of national anthems. No mention of the days in Washington would be complete without reference to the generous hospitality of the local committee. The delegates were taken to see many beautiful and historic places in and near Washington.

Leaving Washington at midnight of October 3rd in five special trains, the delegates found themselves at "Philadelphia in the morning," and at the beginning of a wonderful day, thanks to the National Dairy Council and the good people of the Quaker City. The great work of the National Dairy Council in and around Philadelphia was fully demonstrated. A big banquet, at which Governor Pinchot was the principal speaker, concluded the day's proceedings, after which we were taken back to the trains and tucked into our berths. Next morning we were at Syracuse to begin the real work of the Congress and to see the National Dairy Show, which was being held at the same time, but which was quite distinct from the Congress.

There were 27 sessions of the Congress held at Syracuse, 5 sessions being held concurrently in different auditoriums within a short distance of each other. By means of blackboard bulletins the delegates in any section were kept constantly advised as to what was going on in all the other sections. Every paper was

numbered, and the use of certain signs and marks informed delegates what papers had beeen read, what was being read, and the one that was to follow in all the other sections.

The 207 papers on the programme at Syracuse were grouped according to subjects, each subject occupying one full session. The subjects were as follows:—

The Use of Evaporated, Condensed and Dried Milk in the Dietary;
Business Organization;
Cheese Problems;
Extension Methods in Dairy Education;
Conference on Dairy Publications;
The Nutritional Value of Milk;
Ice Cream Problems;
Methods of Improving and Protecting the Milk Supply;
Instruction in Dairying in Educational Institutions;
Conference on Dairy Publications (Second Session);
Methods of Educating the Public to the Value of Milk;
Co-operative Marketing of Milk;
Control of the Quality of Manufactured Products;
Transportation of Milk;
Milk in the Diet;
City Milk Problems;
Co-operative Marketing of Manufactured Products;
Butter Problems;
Milk Secretion and the Nutrition of Dairy Cows;
Chemistry and Bacteriology of Milk;
Equipment: Materials and Standardization;
Condensed Milk and Milk Powder;
Control of the Quality of Milk;
Breeding Methods;
Diseases of Dairy Cattle.

The outstanding feature of the Congress was the prominence given to health and nutritional topics. The reading of papers at one session by four of the world's leading nutritional experts, all of whom advocated a greater use of milk, was a fact of enormous importance to the industry. Indeed the Congress was almost as

Ayrshire Herd from the Province of Quebec first in the State Herd Contest, National Dairy Show, 1923, Syracuse, N.Y.

much of a health and nutrition event as it was a gathering in the interest of pure dairying.

There were a large number of delegates at the Congress from Great Britain, representing the Departments

of Health and Agriculture and various organizations. It was the first international dairy congress that the British Government has ever recognized or been represented at officially. These delegates have gone back home determined to put into practice some of the methods that have been employed so successfully on this side of the Atlantic in promoting a greater use of milk and milk products. One can hardly estimate the results that may follow.

President Van Norman, and the members of the various committees, are to be congratulated on the manner in which the congress was planned, and on the foresight which had provided so much detail in advance. Their efforts have resulted in a notable contribution to Dairy Progress. Dr. L. A. Rogers, Dairy Division, Washington, Chairman of the Programme Committee, deserves special mention.

Canada was well to the front at both the Congress and the Dairy Show. No other "foreign" country sent nearly as many delegates, and Canadians had a prominent place on the regular programme and at the numerous functions of a more or less social character. The prizes won at the Show by Canadian dairy cattle were very notable.

DOMINION DAIRY CONFERENCE

THE Dominion Dairy Conference, called by authority of the Hon. W. R. Motherwell, Minister of Agriculture, was held at Ottawa, November 29, 30, and December 1, 1923. All the dairy organizations in the Dominion were invited to send delegates. There were, in all, sixty-four in attendance, and the Conference is regarded as the most representative of any hitherto held in Canada in connection with the dairy industry.

The list of appointed delegates follows:—

LIST OF DELEGATES

MINISTERS OF AGRICULTURE

*Hon. J. E. Caron, Quebec.
*Hon. Jas. Martin, Ontario.
*Hon. C. M. Hamilton, Saskatchewan.
Hon. Geo. Hoadley, Alberta.
Hon. John H. Myers, Prince Edward Island.

DEPUTY MINISTERS OF AGRICULTURE

*Dr. David Warnock, Victoria, B.C.
*H. A. Craig, Edmonton, Alta.
F. H. Auld, Regina Sask.
*J. H. Evans, Winnipeg, Man.
W. Bert. Roadhouse, Toronto, Ont.
*J. Ant. Grenier, Quebec, P.Q.
Harvey Mitchell, Fredericton, N.B.
*Dr. M. Cumming, Secretary for Agriculture, Truro, N.S.
*W. Boulter, Secretary for Agriculture, Charlottetown, P.E.I.

MEMBERS OF PARLIAMENT

*L. S. Rene Morin, St. Hyacinthe, Que.
W. F. Kay, Phillipsburg, Que.
*J. W. Kennedy, Apple Hill, Ont.
John L. Stansell, Straffordville, Ont.

PROVINCIAL DAIRY BRANCHES

Prince Edward Island: W. J. Reid, Director of Agricultural Instruction, Charlottetown.
Nova Scotia: W. A. MacKay, Dairy Superintendent, Truro.
New Brunswick: J. R. Sutherland, Dairy Superintendent, Sussex.
Quebec: Geo. Cayer, Dairy Produce Grader, St. Hyacinthe; E. Bourbeau, General Cheese and Butter Inspector, Quebec.
Ontario: G. A. Putnam, Director of Dairy Instruction, Toronto: G. G. Publow, Chief Dairy Instructor Eastern Ontario, Kingston; F. Herns, Chief Dairy Instructor Western Ontario, London.
Manitoba: L. A. Gibson, Dairy Commissioner, Winnipeg.
Saskatchewan: Percy E. Reed, Dairy Commissioner, Regina.
Alberta: C. Marker, Dairy Commissioner, Edmonton.
British Columbia: Henry Rive, Dairy Commissioner, Victoria.

DAIRY SCHOOLS

St. Hyacinthe, Que.: Dr. A. T. Charron, Director.
Kingston, Ont.: L. A. Zufelt, Superintendent.
Guelph, Ont.: H. H. Dean, Professor of Dairying.
Winnipeg, Man.: R. W. Brown, Professor of Dairy Husbandry.

DAIRYMEN'S ASSOCIATIONS

Prince Edward Island: J. H. Simpson, Bay View; J. S. Cousens, Park Corner.
Nova Scotia: W. J. Bird, Department of Agriculture, Truro; C. R. DeLong, Barss' Corners.
New Brunswick: A. J. Gaudet, St. Joseph; Heber Huggard, Norton.
Quebec: J. H. Crepeau, St.-Camille; Raoul Dumaine, St-Francois-du-Lac; Alexandre Dion, Department of Agriculture, Quebec.
Eastern Ontario: G. A. Gillespie, Peterborough; Alex. McGruer, Brinston's Corners; Wm. Newman, Lorneville.
Western Ontario: Jas. Newbigging, Atwood; W. G. Medd, Exeter; Thos. Ballantyne, Stratford.
Manitoba: Alex. McKay, Winnipeg; Thos. H. Rumbal, Miami.
Saskatchewan: J. A. Caulder, Moose Jaw; B H Thomson, Boharm.
Alberta: J. P. Donald, Edmonton; N. S. Smith, Olds.
British Columbia: W. J. Parks, Vancouver; P. H. Moore, Essondale.

MONTREAL PRODUCE MERCHANTS' ASSOCIATION

P. W. McLagan, 720 St. Paul St. West, Montreal.
E. H. Hodgson, c/o Hodgson, Rowson & Co., Montreal.

UNITED DAIRYMEN CO-OPERATIVE

W. W. Moore, Harbour Cold Storage, Montreal.

CO-OPERATIVE FEDEREE DE QUEBEC

J. Arthur Paquet, 114 Rue St. Paul Est, Montreal.

THE CANADIAN CREAMERY ASSOCIATION OF ONTARIO

Charles Johnston, Ontario Creameries, London, Ont.
H. S. Johnston, Lindsay, Ont.

CANADIAN PRODUCE ASSOCIATION

Jas. T. Madden, 90 Colborne St., Toronto
E. J. Smith, Whyte Packing Co., Brockville.

ONTARIO MILK PRODUCERS' ASSOCIATION

E. H. Stonehouse, 186 King St. W., Toronto.

NATIONAL DAIRY COUNCIL

F. M. Logan, Saskatchewan Co-operative Creameries Ltd., Regina.

DELEGATES AT LARGE

Prof. A. Leitch, Department of Agricultural Economics, O.A.C., Guelph.
J. H. Scott, Official Butter Grader, Municipal Abattoir, Toronto.
Avila Caza, St. Anicet, Que.
Nap. Charest, c/o J. J. Joubert, 975 St. Andre St., Montreal.
Frank Boyes, Dorchester Station, Ont.
F. J. Knight, Foxboro', Ont.
P. Pallesen, Central Creameries, Calgary, Alta.
*Georges Bouchard, M.P., Ste. Anne de la Pocatiere, P.Q.

The delegates were apparently convinced of the necessity for active measures to promote high standards in the dairy industry, and showed an earnest desire to grapple with the present dairy situation so as to bring about the necessary improvements.

There were long discussions on the various items of the Agenda, of which reports have appeared in the daily papers, and more detailed reports will appear in the agricultural press.

The following resolutions and reports of Committees were presented and adopted:—

Uniform Dairy Legislation

The question of uniform provincial dairy legislation was brought up and after much discussion the following resolution was moved by Mr. F. M. Logan, seconded by Mr. N. S. Smith, M.L.A., and unanimously carried:—

WHEREAS it would appear that uniform dairy legislation throughout the provinces of Canada would be of great benefit to the industry;

AND WHEREAS this Conference hereby approves of the principle as far as the same is practicable: Therefore be it

RESOLVED, That a Committee be appointed to prepare a model Dairy Bill and regulations, and that the following constitute such Committee: The Federal Dairy and Cold Storage Commissioner, the Dairy Commis-

*Unable to attend.

sioners or the head of the Dairy Division for each province, with power to add to their numbers.

FURTHERMORE, that the Federal Dairy and Cold Storage Commissioner is hereby requested to provide a Secretary for the work of the Committee, and to report as soon as possible.

Report of Cream Grading Committee

The expressed opinion of the Conference was unanimously in favour of the grading of cream. The following report was presented by Mr. Joseph Caulder, Sask., who moved its adoption, seconded by Mr. E. H. Stonehouse, Ontario, and unanimously concurred in by all present:—

RESOLVED, That this Conference is in favour of and recommends compulsory grading of cream. The Conference also recommends the adoption by all provinces of the following cream grading standards, which are now in effect and have been in effect for some time in several of our provinces, and are as follows:—

(A) TABLE CREAM

This grade shall include any lot of sweet, clean-flavoured, non-frozen cream bought for re-sale for household use and which is produced under conditions that comply with the special requirements of the municipality in which it is to be sold for consumption. The acidity of cream in this grade shall be not more than twenty one-hundredths of one per cent (.20%) at the time of grading. The term "Table Cream" may be supplemented by the trade terms "Inspected" or "Extra Special" as the initial purchaser may in each case uniformly adopt.

(B) SPECIAL GRADE

This grade shall include any lot of cream which is clean in flavour, of uniform consistency and fit for making into Special Grade butter. The acidity of cream in this grade shall not be more than thirty one-hundredths of one per cent (.30%) at the time of being graded at the creamery where it is to be manufactured into butter.

(C) FIRST GRADE

This grade shall include any lot of cream which is reasonably clean in flavour, of uniform consistency and fit for making into butter of this grade. The acidity of cream in this grade shall not be more than sixty one-hundredths of one per cent (.60%) at the time of being graded at the creamery where it is to be manufactured into butter.

(D) SECOND GRADE

This grade shall include any lot of cream that does not meet the requirements specified for the next higher grade; such as cream which is butter, stale, musty, metallic, or otherwise unclean in flavour.

(E) OFF GRADE

This grade shall include any lot of cream with a very objectionable odour or flavour, such as kerosene, gasoline, stinkweed, onions or such other flavours as may render cream unfit for making into second grade butter.

THAT to ensure the safe-guarding of the reputation of Canadian butter on the markets of the United Kingdom, in case all provinces do not find it feasible to adopt compulsory cream grading and the standards hereinbefore set forth, this Conference further recommends that the Federal Department put into effect as soon as possible the following export regulations regarding butter, viz:—

1. That federal grade certificates shall not be issued on any butter which does not score first or better at the time of export;

2. That no certificate shall be issued for butter made from cream which has not been properly pasteurized.

Size of Dairy Factories

The size of dairy factories was very fully discussed, and while it was generally conceded by those present that the increasing number of small factories was a menace to the dairy industry, it was also felt that at present nothing definite could be done to overcome this drawback, but the following resolution was moved by Prof. Leitch, seconded by Mr. L. A. Gibson, and unanimously carried:—

WHEREAS the perpetuation and continuance of the small cheese factory and creamery is a decided menace to the industry as well as a source of much financial loss;

AND WHEREAS it is neither feasible nor advisable to regulate the size of any such manufacturing plant by any form of Government action;

AND WHEREAS the only possible method of control of this important factor is the spreading of knowledge of the certain financial outcome of the operation of minimum-sized factories;

AND WHEREAS this knowledge can come only from a study of the business operations of representative factories now in operation: Therefore be it

RESOLVED, That the Federal Department of Agriculture be urged to take such steps in co-operation with the Provincial Departments of Agriculture, as will make this needed information available to those whose duties and responsibilities are therewith concerned.

Guarantee of Quality

The question of cheese and buttermakers being required to guarantee a No. 1 cheese or butter having been duly discussed, the following resolution was moved by Mr. A. E. McGruer, seconded by Mr. W. W. Moore, and unanimously carried:—

BE IT RESOLVED, That while this Conference recognizes that there should be some safeguard against carelessness or inefficiency on the part

Holstein-Friesian Herd from the Province of Ontario, first in the State Herd contest, National Dairy Show, 1923, Syracuse, N.Y.

of the cheese or butter-maker, it is the opinion of this Conference that the existing custom of requiring cheese and buttermakers to guarantee a No.

1 product is not in the best interest of the dairy industry, inasmuch as it opens the way to improper practices, and often makes it more difficult to effect an improvement in quality in the individual factories.

Green Cheese

The shipping of green cheese and the resultant injury to the Canadian cheese trade was fully discussed and comparisons were made with the practices in other countries. It was shown that our chief competitor requires by law that cheese shall be fourteen days old before it is graded, notwithstanding the fact that three months must elapse before it can be placed on the market.

While no resolution was submitted to the Conference on this subject, the concensus of opinion was in favour of more time being given for the cheese to mature before being shipped overseas.

Regulation 12 under *The Dairy Produce Act* provides that no cheese shall be graded until it is sufficiently matured in the judgment of the grader to permit the quality being properly determined. It seemed to be the general opinion of the Conference that the enforcement of this section of the regulations would tend to correct the abuse of shipping green cheese.

Loading Warm Butter

The injurious practice of loading warm butter into refrigerated space on steamers along with butter that has been thoroughly chilled or frozen, was one of the important subjects brought under discussion. Representatives of the railways and steamship companies were present, and explained their side of the case to the Conference. Mr. J. F. Singleton, Chief, Markets Division in the Branch, produced a large number of figures giving the temperatures of butter as loaded on steamers, and thermograph records showing the temperatures maintained in the ships' refrigerators during the voyage to the United Kingdom.

The following resolution was moved by Mr. F. M. Logan, of the Saskatchewan Creameries Company, Regina, and seconded by Mr. Alex, McKay of Winnipeg, and unanimously carried:—

RESOLVED, That it is advisable for this Conference to go on record as recommending that all butter for export shall register 25 degrees F. or lower, before it goes on board the steamer, and that some regulation be passed to that effect.

ADMISSION OF CANADIAN STORE CATTLE TO GREAT BRITAIN

Following the discussion that took place at the Imperial Conference relating to the interpretation and administration of *The Importation of Animals Act* and the Regulations governing the admission of store cattle from Canada into Great Britain, a memorandum, outlining the proposed concessions, has been received from the British Minister of Agriculture by the Prime Minister of Canada.

The memorandum sets out that while the British Minister of Agriculture cannot surrender the final word in deciding whether any particular animals come within the provisions made for the admission of store cattle into the United Kingdom, at the same time every desire is felt to meet as far as possible the wishes of the Dominion.

Subject to the foregoing proviso, instructions would be given to the

Ministry's Inspectors at the port of entry as follows:

(a) In the case of any cattle which the Inspector is satisfied can reasonably be regarded as suitable for feeding for a further period of not less than 28 days before slaughter, the Inspector will on application grant a license for their removal from the landing place to any special authorized market or other premises, subject only to the conditions embodied in the Schedule to the Importation of Animals Act, 1922.

(b) In the case of cattle where the Inspector is not so satisfied, the Inspector will on application either:

(1) grant a license for their removal to a slaughter-house for slaughter with such conditions as may be considered necessary to secure their slaughter thereat and will not, as at present, require them to be slaughtered at the landing place, or

(2) if the owner of the cattle is prepared to undertake that they will be fed for not less than 28 days before slaughter the Inspector will grant a license for their removal to premises other than a slaughter-house subject to such conditions as may be considered necessary to secure that the undertaking will be observed.

In either case the additional conditions imposed by the Schedule will necessarily apply.

Cattle for which a license is not applied for or in respect of which a license cannot be granted in accordance with these instructions will have to be slaughtered at the landing place as heretofore.

It must be understood that cattle which have not complied with the conditions applicable to stores, i.e., three days' isolation and supervision in Canada and supervision by a veterinary surgeon on the ship, must continue to be landed at an imported animals wharf and not at an imported animals landing place and will accordingly be slaughtered in the wharf. The Ministry has no power to allow such cattle to be moved from the wharf to a slaughter-house.

Jersey Herd from the Province of Ontario, first in the State Herd Contest, National Dairy Show, 1923, Syracuse, N.Y.

The British Minister of Agriculture states that this offer is made with the desire of meeting as far as possible the views presented by the

Canadian representatives, consistently with his primary duty to safeguard the interests of British agriculturists. The request is made that the Canadian Government co-operate in giving instructions to their officers not to certify as store cattle animals that cannot reasonably be regarded as suitable for feeding for the period above referred to. The Minister expresses himself as of opinion that, with good-will on both sides, the Act can be administered satisfactorily.

CANADA'S AGRICULTURAL PRODUCTS AND THE BRITISH MARKET

On his return from Great Britain at the end of November, 1923, the Deputy Minister of Agriculture, Dr. J. H. Grisdale, issued the following statement as to market conditions in that country and as to the position and outlook for a number of Canada's leading agricultural products at the time of his visit.

Cattle Trade

Commenting upon the situation in general, Dr. Grisdale intimated that Canadian store cattle were making steady progress in the estimation of the British feeder. The stores now being sent over were quite equal, if not superior, to those exported before the institution of the embargo thirty years ago, and were likely soon to enjoy as good a reputation as they ever did.

The question of ocean space and carrying charges was still a vexatious one, and while immediate improvement does not appear likely, Dr. Grisdale is hopeful that negotiations now in process both in this country and Great Britain will bring good results.

There is at present a great opening in Great Britain for fat cattle for immediate slaughter, and, as a rule, the trade is fairly profitable. It is too a trade that seems likely very shortly to be entirely in the hands of the Canadian exporter since the number going forward from the United States, the only other country taking any part in this trade, has been gradually decreasing year by year. Nor are they likely to be in a position to send more in the future since their own increasing population is practically certain to require all the beef they can produce and more.

As to the stocker trade, I am confident that much more satisfactory progress and more certain and remunerative returns may be anticipated from now forward.

Bacon

Our trade in bacon is I find improving and Canadian bacon seems to be meeting with very considerably less criticism this year than was the case on the occasion of my visit in 1922. Prices were, of course, a little better than at that time, which would account for the improved tone in some measure, but I was informed also, and my own observations led me to believe as well, that the quality of our bacon has improved somewhat in the year that has just passed. This may be due, and I am inclined to think it is due, in some measure at least, to our new hog grading law which went into effect about a year ago. There is, of course, still some bacon of rather inferior quality reaching Great Britain from this country, but the average has improved and the reputation of our Canadian article is certainly getting better. We won out in the London Dairy Show as amongst exhibitors

from the different Dominions and we won out quite easily. Of course, this does not mean a very great deal since none of the other Dominions, save Ireland, are very prominent in this industry; nevertheless it has the effect of improving our reputation and should materially benefit the trade.

The great trouble with our bacon trade is the lack of volume. Canada can never hope to take a very prominent part in the bacon industry so long as she offers the small quantity that she now sends forward. The total amount of bacon sent from Canada to Great Britain constitutes but a very small percentage of the bacon consumed in that country, probably not 10 per cent at the outside. There is no reason why the quantity sent should not be three or four times as great as it is at present. To reach such proportions it would not, of course, be necessary for Canada to produce three or four times as many hogs, since her home consumption is not likely to increase very rapidly and any increase in the bacon output of our packing houses would practically all be available for export, hence an increase of 100 per cent in the number of hogs kept in the country, really a small matter when the present hog population of three or four millions only is considered, would mean an increase of quite possibly 500 or 600 per cent in the quantity of bacon exported to Great Britain. We would then be in a position to take our rightful place in the British market, and would become a real factor in the trade. This, in my opinion, is the objective we should have in mind, and if, in conjunction with such a decided increase in our output we could have improved quality, as we certainly could, then our bacon would, I am confident, command practically the same price as the Danish article, which, in very many cases indeed did not seem to me to be at all superior to the Canadian article, and it was admitted by many of the handlers of bacon in London that there was really very little preference due the Danish bacon so far as quality was concerned. Bacon production is possibly the one line in which the Canadian farmer can make a decided profit at the present time and is the line in which he may be expected to continue to make a profit.

Dairy Produce

Our dairy products, I am sorry to say, do not seem to have made very much progress in the past year, although possibly there is some improvement on the whole, and there seems to be a better feeling amongst the trade than was the case a year ago.

Canadian cheese has been standing up better this year than for some time, and as a rule is commanding a somewhat higher price than its great competitor, the New Zealand article. We were able to carry off first and second in the Dairy Show and the dealers with whom I discussed this trade were of the opinion that we are now sending forward a considerably more uniform article than we had been doing for some little time past. I am incl ned to attribute this improvement, in some measure at least, to our grading system of export dairy products put into effect last spring, and the British dealers were of the same opinion. This law, which has been in effect during the past season, is, however, susceptible of improvement, or at least the regulations thereunder can, I believe, be materially improved, and while there may be some little difficulty in persuading some of our people that further control is essential to further progress I am, nevertheless, of the opinion that some additional control will have to be imposed and that it will result in

very decided benefits to the industry generally, and to Canada as a whole.

Our butter trade is very small, and, I regret to say, in rather ill repute. The great diversity in quality and packing very materially affects the price paid, and is the very serious problem now confronting the Canadian dairyman. In fact it is so serious that by instruction of the Minister a convention has been called to discuss ways and means of improving our dairy products as to uniformity in quality and colour. This step is being taken not a day too soon if we would save our butter trade, or, rather, if we would hope to build up a trade with Great Britain where we have really very little at present.

Canadian Eggs

Canadian eggs are still looked upon as an excellent article in Great Britain, but here again the quantity sent forward is very small. Our egg grading regulations are very certainly the most advanced in the world, and will, I am confident, have the ultimate effect of developing this industry, as they have already had the effect of building up for us a very excellent reputation. Unfortunately for us, eggs reach Great Britain from a very great number of countries. On some of the markets one can see eggs from 25 or 30 countries all at the same time. These eggs are sold, in many cases, under no particular name, so far as the retail trade is concerned at least, but Great Britain is contemplating legislation in connection with the marking of goods, and should this legislation be passed, as I anticipate it will be in the near future, then our eggs will be one of the articles to benefit most materially therefrom.

Canadian Apples

I was in London when Canadian apples were coming forward in great quantities to Great Britain and was very pleased to note the general good repute in which they were held. Some of our shippers, however, have been making very serious blunders in sending forward apples rather badly packed, and in shipping forward, also, apples that looked like windfalls. This had the effect of lowering the average price on the British market by some shillings per barrel. It also hurts the general trade and cannot help but work very serious injury to the reputation of our Canadian fruit should the practice be continued. Our reputation has been gradually brought up for a number of years and has received a tremendous boost this year by our most important winnings at the Manchester Fruit show held a few weeks ago when Canada carried off premier honours in the Empire class for apples. The demand for Canadian apples in Great Britain can be very materially increased if the right article is sent forward and properly handled there.

On the whole I am of the opinion that Canadian agricultural products will in the future command more and more the attention of the British consumer and, therefore, of the British commission men. Canada is quite evidently giving more attention to the requirements of the British consumer and to his likes and dislikes than is any other of the Dominions, and than is any other supplier, speaking in a general way. We must not, however, hesitate in our efforts for a moment if we would hold our place and improve the same in these British markets. The British consumer likes what he likes regardless of who will furnish it to him, and any falling off in quantity or quality very quickly reacts to injure still further the trade affected. Our producers and handlers of agricultural products in Canada must not, therefore, expect to have any opportunity of resting on their oars or awaiting developments. Our only chance is constant and strenuous

effort looking to improvement in quality, increase in quantity and regularity in the supply and uniformity in the character of the produce we would sell the Mother Country.

In Great Britain, just as in Canada, the greatest problem to be overcome in connection with profit making on the farm is the cost of distr.bution of the finished product, and I honestly believe that the burden in this respect is greater in Britain than it is in Canada.

BOVINE TUBERCULOSIS: THE RESTRICTED AREA PLAN OF ERADICATION

By GEO. HILTON, V. S., Acting Veterinary Directory General

THE control of Bovine Tuberculosis has always been a difficult problem, chiefly because of its wide prevalence and the tremendous cost involved, and because it has always been difficult to obtain the general support of live stock owners.

The very character of this disease, and the previous history pertaining to its modes of infection and methods of spreading, indicate very clearly that satisfactory progress in its control and eradication cannot be expected unless the stock owner is interested and co-operates in every possible way with the officers engaged in this work. It has, therefore, been necessary for many years to exercise caution in formulating policies for the control of this disease. Progress has accordingly been limited to the state of public opinion. As stockmen became familiar with the older plans for the control of this disease they commenced to realize that many of the difficulties experienced by them in protecting their clean herds would be materially lessened if tuberculosis were also eradicated from all the herds in the district.

This question became a live one in live stock organizations, and the Western Canada Live Stock Union, at its annual meeting in Regina in December, 1921, devoted the whole of one afternoon session to discussing the question of controlling bovine tuberculosis. As a result of their deliberations, a resolution was passed favouring the adoption of the Restricted Area Plan for the eradication of this disease.

A copy of this resolution was forwarded to the Honourable W. R. Motherwell, Minister of Agriculture, who, after due consideration, decided that the time was opportune to give this more advanced policy a trial and an Order in Council was, therefore, passed on December 11, 1922, providing for Regulations relating to the Establishment and Maintenance of Restricted Areas for the Eradication of Bovine Tuberculosis.

The Restricted Area Plan has for its object the eradication of Bovine Tuberculosis from definite areas. It is a more radical plan than our older policies, as it involves the testing of all classes of cattle in a specified territory and the slaughter of all diseased animals. It is a co-operative plan between the Federal and Provincial Governments and the stock owner, and offers an exceptional opportunity to eradicate this disease from large areas, also their maintenance from it in a practical and economical manner.

The regulations provide that the application for assistance under this plan must be forwarded to the Federal Minister of Agriculture by the Minister of Agriculture of the Province

70305—2

in which the area is located. The location and boundaries of the proposed area must be given, the approximate number of cattle within it, and there must also be a statement to the effect that a majority of at least two-thirds of the cattle owners in the area have expressed a desire to have all the cattle in the area tested for the eradication of tuberculosis. Under this plan, therefore, all cattle are systematically tested with tuberculin by Veterinary Inspectors of the Health of Animals Branch. Reactors are permanently earmarked by punching the letter "T" through the right ear, and are valued by the veterinary officer. The maximum value permitted by law for purebreds is $150 and $60 for grades, and the owner receives two-thirds of the appraised value in compensation in addition to the value of the carcase.

As the essential feature in the eradication of tuberculosis is the separation of the diseased cattle from the healthy ones, and the wider they are separated and the less communication there is between them afterwards, the greater the possibility of establishing clean herds, reactors after having been valued and earmarked are promptly shipped for slaughter under official supervision, and the premises from which they are removed are thoroughly cleansed and disinfected. All herds in which reactors have been found are retested as soon as possible after a sixty day period has elapsed from the date of the cleansing and disinfection of the premises. This procedure is necessary in order to pick out animals in which the disease had not progressed sufficiently to produce a reaction at the previous test, and this is the earliest period at which a retest can be applied with reliable results.

The regulations further provide for the protection of the herds in the area from the introduction of infection from outside sources. Cattle intended to be brought into the area for permanent stay must first be tested with tuberculin by a veterinary inspector, and no cattle are permitted to be brought in for this purpose unless they have passed a satisfactory test.

Untested cattle may be shipped for transit through the area, but, if necessary to unload within the area, they must be unloaded at points specially designated for this purpose, where they can be kept from coming in contact with area cattle.

Untested cattle are not permitted to be driven across the area by road, unless special permission is first received in writing by the veterinary inspector in charge of the area.

Untested cattle may be brought into the area for immediate slaughter, provided they are not allowed to come in contact with area cattle and are kept isolated until slaughtered.

With a view to further protecting the cattle from possible infection, the feeding of by-products of cheese factories, skimming stations and butter factories, is prohibited within an area unless the said by-products have first been sterilized by heat.

The first and only application for assistance under this plan was received soon after the order was passed from the Deputy Minister of Agriculture for the Province of Manitoba, covering an area in the Carman district, consisting of twenty townships. After due consideration the application was accepted and arrangements were made to organize the work of testing all cattle in the area. These tests were commenced on February 1, 1923, and although bad weather conditions made transportation difficult, it was possible, owing to most active co-operation of all the stock owners, to complete the test of all the cattle, numbering 16,435 head, in a period of six weeks, with the employment of eleven veterinary officers.

Nine hundred and eighteen (918) of these cattle reacted, or 5·58 per cent. These were promptly shipped for slaughter to abattoirs under Government inspection, and after the infected premises had been satisfactorily cleansed, disinfected and released, compensation amounting to $32,830 was paid. All herds from which reactors had been removed were tested after a period of sixty days had elapsed. There were 344 of these herds, which contained 5,990 cattle, and 97 reactions were obtained, or 1 6 per cent. The reacting cattle were slaughtered, the premises disinfected and $3,128 was paid in compensation.

The ninety-seven (97) reacting cattle were found on fifty-one (51) premises, and on four of these all the cattle were diseased, leaving forty-seven (47) infected herds to retest after a sixty day interval. At this test two reactors were found on one premises. These animals were slaughtered, the premises disinfected and $49 33 was pa'd in compensation.

Ten veterinary inspectors were engaged in conducting the second general test of all cattle in the area, and this work was completed in October, having occupied a period of four weeks.

There were 15,600 cattle in the area at this test, and 87 of these reacted, or .55 per cent, for which $3,154 was paid in compensation. These reactors were found on 67 different premises and after they were removed for slaughter the premises were thoroughly cleansed and disinfected.

It will be necessary to retest the herds on these premises as soon as a sixty day period has elapsed.

Experience in dealing with th's disease has shown that, with the continued support of the stock men, infection will be ultimately eradicated from th's area, but it will require the utmost vigilance and perseverance. Great care will have to be exercised to prevent the introduction of infection from outside sources, and as a tuberculous cow is undoubtedly the most prolific disseminator of infect'on, cattle for addition to clean herds should be purchased only from herds in which infection has not been found, or from those in which it has been elim'nated.

Regulatory measures are essential in suppressing contagious diseases, and, unfortunately, however wisely administered, they are in many cases irksome and cause inconvenience and financial losses to stock owners. No trouble was, however, experienced in conducting this work in the Carman district. The stockmen were willing and anxious to assist in the eradication of this disease, and w'th their active co-operation it was possible to make satisfactory progress.

This plan affords an excellent opportunity for systematic and methodical work, and enables the testing of the greatest number of cattle in a given per'od. The prompt slaughter of all diseased cattle and the cleansing and disinfection of all infected premises provide a clean territory for healthy herds, which gives the owners a better opportunity to maintain their herds free from tuberculosis.

The advantages to a stock owner in a restricted area are many. A tuberculosis-free herd is a valuable asset. Tuberculous cows on an average are not so long lived as those free from it. The percentage of digestive and other disorders is much greater in a tuberculous herd, resulting in severe losses through dimin'shed milk supply, and premature deaths are much more frequent. Tuberculous animals are a poor market for the feed produced by the stock raisers, as the same profitable returns cannot be made in feeding tuberculous animals as healthy ones.

The value of a herd is much enhanced by the elimination of tuber-

culosis, and there is a greater demand for animals from such herds. The owner also has the satisfaction of knowing that he is raising cattle free from tuberculosis, and especially so as it is not at all an uncommon thing for this disease to be transferred from cattle to man, and more particularly to young children by means of raw milk. The eradication of tuberculosis is, therefore, not only an economic problem but of great benefit to the public health of the state.

NEW REGULATIONS UNDER THE DESTRUCTIVE INSECT AND PEST ACT

By LEONARD S. McLAINE, Division of Foreign Pests Suppression; Secretary, Destructive Insect and Pest Act Advisory Board, Department of Agriculture, Ottawa

THE complexities that have arisen in the past twenty-five or fifty years in connection with the exchange of commodities throughout the entire world, also the increase in the diversity of established trade routes, and the danger that naturally results from the movement of products infested with pests and diseases have made it necessary for man to take every reasonable precaution to prevent insofar as possible, the introduction of new species of pests and diseases into uninfected areas. Whether it is due to a keener sense of observation on the part of the general public, or whether it may be regarded as an established fact, nevertheless, there has been apparently a great increase in the amount of damage caused by insect pests and plant diseases during the past few decades.

Although it is realized that all the pests responsible for damage on this continent are not of foreign origin, many of our worst enemies are not native to this hemisphere. It is also known that there are many very serious pests present in the older portions of the world which might prove to be most undesirable guests if they were permitted to gain a foothold on our soil. Apparently one of the most feasible means of controlling the introduction of menaces such as these is by enacting laws that restrict or prohibit the importation of products and commodities likely to harbour these insect pests and plant diseases. It has been frequently stated that we on this side of the water are suffering from too much legislation of all kinds and descriptions, and while that may be true, I am afraid that we shall have to continue being burdened by pest legislation, or until such time as it is realized by all nations and peoples that only products free from pests and diseases shall be offered for exchange. A step in this direction was made in 1914 by the International Phytopathological Conference, held in Rome. Unfortunately, the great war made it impossible to continue the discussions or bring into general operation some of the resolutions that were passed at that time.

Questions in relation to legislation, however, were discussed at the recent international conference on entomology and phytopathology, convened by the Dutch Government at Wageningen, Holland, in June, 1923. The Dominion Entomologist, Mr. Arthur Gibson, who attended this conference and took part in the discussions, states that the following resolution was adopted:—

> "The representatives of all nations assembled at this International Entomological and Phytopathological Conference, June 25-30, 1923, at Wageningen, desire to

place themselves on record as in full agreement with the essentials of international trade and commerce in living plants and plant products, namely reasonable freedom from all insect pests and plant diseases of all kind of materials imported into, or exported from any country."

The history of the introduction of the major foreign pests now present on this continent is too well known to need repetition, and it is also recognized that all the pests and diseases were not imported on such products as nursery stock. An excellent example is the European Corn Borer, which circumstantial evidence showed was imported on broom corn from Europe. This has been substantiated by the finding of an outbreak of this insect at one of the ports of importation for broom corn and where it was held for sterilization. As a consequence, pest legislation should be passed and brought into force only after a careful study of the entire situation has been made. This will entail an investigation of the product from its source to its ultimate destination, the trade routes it has to follow and whether it is an essential commodity or not. Until this is done mistakes are likely to be made and disastrous results follow. Crises arise, however, which make it imperative to take immediate action, and financial loss may result, but such cases are very fortunately comparatively infrequent. Care must also be taken to base the legislation on a strictly scientific foundation and not to be influenced by commercial possibilities. This is a point which needs special attention in these days of keen trade rivalry and competition.

Insect legislation in Canada dates back to 1883, when an Act was passed in Prince Edward Island to prevent the spread of the Colorado potato beetle. With the appearance of the San José Scale in British Columbia, legislation was passed in 1894, empowering the Horticultural Board to inspect and treat plants and plant products for pests and diseases. Four years later the first Federal Act was passed, known as the San José Scale Act. This law together with the regulation prohibited the importation of host plants of this insect from the United States, Australia, Japan and the Hawaiian Islands. With the discovery of effective fumigation methods the law was modified in 1900 and permitted the importation of fruit stocks, etc., provided they were treated at one of the several Federal fumigation stations.

As a result of a serious outbreak of the brown tail moth in France, and the finding of many nests on shipments of imported nursery stock, an active campaign was started to inspect all foreign shipments of this character. The following year, 1910, the Destructive Insect and Pest Act was passed and all Federal Legislation since that time has been issued as regulations under this law.

The Act stands as a monument to the men who were responsible for its preparation, for although innumerable regulations have been passed in accordance with its authority, and on all manner of subjects, it has never been necessary to recommend an amendment to the Act itself.

Two years ago it was realized that the question of insect and pest legislation had assumed such a complicated aspect and involved so many different problems, not only as regards plant life, but also trade and manufacturing interests, that in order to better co-ordinate opinion and effort it was deemed advisable to create an Advisory Board to consider such matters. On April 21, 1922, the Destructive Insect and Pest Act Advisory Board was constituted, and five officials of the Department of Agriculture were appointed members.

The Board is not empowered to pass legislation, but may recommend to the Minister of Agriculture any changes that are considered advisable and in the public interest, and in addition, may call upon other officials of the Department of Agriculture or other persons to act in an advisory capacity. Furthermore, the Board does not administer the various regulations under the Act, their administration being left to the Branch particularly concerned.

After careful consideration covering more than two years, including much investigation and advice sought from the horticultural interests from one end of Canada to the other, including public hearings, the Board recommended to the Minister of Agriculture a general revision of the Regulations.

On September 1, 1923, the new regulations went into effect. These consist of a series of general regulations and fifteen foreign and six domestic regulations. The general regulations consist of fourteen sections and are more or less comprehensive, but are of particular interest in that they empower the Department to inspect or examine any plants or plant products offered for entry into Canada and if found infested with pests or diseases they may be refused entry, treated or destroyed. They also are of particular value in connection with the handling of shipments not covered by any special regulation or order, such as grains infested with weevils, broom corn, dried fruits, etc. Provision is also made for the inspection of export shipments, the powers of inspectors, interfering with an inspector in the performance of his duties, holding of infested shipments, the right to trespass, the selling of infested material, the importation of plants for scientific purposes, and the paying of compensation.

The foreign and domestic regulations deal with specific problems; they may be increased in number, amended or modified as occasion demands. They are issued in separate form, and, it is hoped, are worded so as to be readily understood by the general public.

In adopting this form, the Department is of the opinion that the average individual may take a greater interest in the safeguards that have been enacted for his benefit. An inquirer will be able to see just what he may or may not do, without the necessity of wading through endless pages of laws which are of no particular interest to him.

Under the Foreign Regulations the importation of nursery stock from foreign countries is governed. All plants for ornamental purposes or propagation except seeds are now classified as nursery stock, and permits are necessary to import such shipments. Nursery stock from countries other than the United States may enter only through certain ports, and all shipments are subject to inspection. It is hoped by this means to prevent, if possible, the further introduction of noxious pests and diseases.

The foreign regulations also restrict the importation of plants from the Hawaiian Island on account of the Mediterranean Fruit Fly; the importation of nursery stock, forest and quarry products from the New England states on account of the Gipsy and Brown tail moths; the importation of corn, cut flowers and other plants from the European Corn Borer areas in the United States. A total prohibition has been placed on the importation of potatoes from countries and localities infected with the Potato Wart Disease; all five-leaved pines and currants and gooseberries from all parts of the world on account of the White Pine Blister

Rust; chestnuts and chinquapins from Asia and the United States on account of the Chestnut Bark Disease; European buckthorn and certain species of barberries from all countries on account of the Crown Rust of Oats and the Black-stem Rust of Wheat; alfalfa hay from the alfalfa weevil infested districts; plants with soil from Asia on account of the Japanese Beetle and other soil infesting insects; all species and varieties of douglas fir, hemlock, and larch from countries other than the United States on account of the newly discovered Douglas Fir Disease; peach stock and hazel, cob and filbert from certain states into British Columbia on account of Peach Yellows and Eastern Filbert Blight.

The domestic quarantines deal with the movement of nursery stock in the Apple Sucker infected areas in Nova Scotia; the movement of corn from the European Corn Borer areas in Ontario. They also coincide with the foreign regulations, prohibiting the movement of pines and currants and gooseberries into Western Canada from the white pine blister rust areas in the east and similarly with the importation of European buckthorn and certain barberries on the prairies, and peach stock and hazel, cob and filberts into the province of British Columbia from eastern Canada.

REGULATIONS UNDER THE SEEDS ACT, 1923

By CLARK HAMILTON, Assistant Chief, Seed Division

THE Seeds Act of 1923, with regulations made by the Honourable the Minister of Agriculture, provides legislation for the uniform control of the merchandising in Canada for the purpose of seeding, and the importation into Canada for the purpose of selling, of all agricultural and garden seeds.

The regulations supplement and define the application of provisions included under the various sections of the Act, and were recommended to the Minister by an Advisory Board, the personnel of which includes representative seed growers elected by farmers' and growers' organizations and representatives of the Canadian seed trade. This board will be asked to act in an advisory capacity when it is deemed necessary to make changes in the regulations.

The regulations include domestic and export seed grade definitions. Domestic grades have been provided to include all kinds of field and garden seeds used in Canada for seeding purposes, while export grades have been defined to include cereals, clovers and grasses.

The following general definitions apply to seed grades as indicated:—

Domestic Grades.—The minimum quality for seeds that may be sold under the grade names prescribed under Section 3, clause (*e*), of *The Seeds Act* shall be as follows: Registered and Extra No. 1 seed shall consist of a kind, variety and selection approved by the Canadian Seed Growers' Association, and which is true to variety name within the limits hereinafter defined. All grades shall consist of seed which shall (1) within comparative latitudes for different grades, be well matured, sound, sweet and well cleaned and graded to remove small, shrunken, immature or broken kernels and inert matter; (2) be at least equal in general appearance to standard grade samples that may be fixed from season to season by the Advisory Board appointed under the Seeds Act, and (3) comply with the minimum standards set forth in the tables.

Export Grades.—The minimum quality for seeds that may be sold under the export grade names pre-

scribed under Section 8 of *The Seeds Act* shall be as follows: Registered and Extra No. 1 seed shall consist of an approved kind or variety which is true to name. The grades Reg'stered, Extra No. 1, No. 1, No. 2 and No. 3 shall be mature, sound, well cleaned and graded as to size of seed, free from dodder, and contain not more than the maximum percentage of prescribed injurious weed seeds; shall conform approximately to one of the colour standards represented by the type samples specified as W, X, Y, Z, in the seed code, and come within the minimum quality standards set forth in the tables.

These definitions are further supplemented by tables under which the several kinds of seeds are somewhat broadly classified into such groups as the cereals, the clovers, the grasses and the field root and garden vegetable seeds. The table which covers a group sets forth the maximum number and nature of impurities per ounce or per pound consisting of weed seeds both noxious and others, the maximum number or percentage of other crop seeds allowed, and the minimum per cent germination and purity of variety which shall be required for the several grades.

Two grade names, namely, Registered and Extra No. 1, have been added to the grade names No. 1, No. 2 and No. 3 included under provisions of *The Seed Control Act of 1911*. Provis'on has also beeen made for the grading of mixtures. The matter of purity of variety applies only to seed lots which in other respects are eligible for the grades Registered or Extra No. 1. Before either of these grade names can be given, it is required that a satisfactory statement of per cent purity of variety based on field inspection be furnished to the inspector who makes the final examination of the seed.

The noxious weeds which shall be cons'dered as primary and secondary are named by regulation, also the kinds of weeds, the seeds of which may be deemed as useless when grading clovers, grasses and lawn grass mixtures. A group designated as harmful includes all weeds not already classified as noxious or useless for the purpose of establishing domestic grades. Another group is referred to as injur'ous weeds and has its application in the giving of export grades.

While grades have been provided for field root and garden vegetable seeds, they are not compulsory. When such seeds are not sold under grade the minimum per cent germination is fixed for each kind of seed below which marking or labelling is required. These minimum percentages range higher than under the old Act.

The procedure to be followed and the implements to be employed in taking official samples, the number of samples that shall be taken and how they shall be forwarded for examination and grade are all fully prescr'bed.

Seed importation restrictions are now included in the regulations under *The Seeds Act*. Importation regulations apply to all kinds of seeds, and those seeds which are unfit for seeding purposes within the mean'ng of the Act are prohibited entry into Canada. Shipments imported for the purpose of selling must conform with the minimum standards of purity and germinat'on for seed of the kind.

Collectors of Customs are instructed to sample all incoming seed shipments and forward the samples to the office of the seed inspector for the district. Seed lots for which a control sample certificate is held by the consignor and on which he has marked grade name and control sample certificate number are released to the cons'gnee upon sampling. Other shipments must be held for test but delivery may be taken under bond pending result of the examination. If the seed does not

conform to the required standard; the consignee may elect to undertake recleaning under bond, but not until satisfactorily recleaned as shown by a retest of the recleaned seed can full release and cancellation of the bond be obtained.

FEED AND FERTILIZER CONTROL

Feed Control—An amendment to *The Feeding Stuffs Act*, effective from October 1, 1923, prohibits the adulteration of wheat mill feeds with screenings, scourings or other foreign materials. Bran must now be pure bran, shorts, pure shorts, and so forth, and the screenings cleaned from the grain before milling must be sold separately as "mill screenings". The law standardizes flour-mill by-products both as to name and chemical composition. As a result of this standardization, feeders may expect much greater uniformity in the quality of similarly-named wheat by-products placed on the market.

Fertilizer Control—During the first year of operation *The Fertilizer Act, 1922*, a reduction has been made in the number of brand names under which fertilizers are sold in Canada from 2,892 to 380. This registration year, it is expected that the number of brands will be reduced further to conform with the new regulations which came into effect last August. This is important to fertilizer users, as it has meant that hundreds of brands of fertilizers that were next to useless in point of plant food content or were sold under misleading names, have been legislated out of the market.

REGULATIONS FOR DAIRY PRODUCTS

UNDER authority of *The Act to Amend the Dairy Industry Act, 1914*, a number of new regulations have been authorized to which the attention of dairymen is directed. The more important provisions are (1) That on and after May 1, 1924, every package containing cheese, creamery butter or whey butter shall bear a registered number showing the factory where it was made, except prints of butter put up under the brand or trade mark of a wholesale or retail dealer; (2) That before January 1, 1924, every person engaged in the manufacture of cheese, creamery butter or whey butter, shall apply to the Dairy and Cold Storage Commissioner at Ottawa for registration, and the registered number given by the Dairy Commissioner shall be used in marking with a stencil the packages of cheese, creamery butter, or whey butter.

The text of the regulations follows:—

1. (*m*) "Whey Cream" means cream which has been separated from whey.

20. Every manufacturer of whey butter who purchases whey cream shall keep a special book in which shall be entered a record of all whey cream received, which record shall show the date each shipment was received, the person from whom each shipment was received, the number of pounds of whey cream, the percentage of fat and the number of pounds of fat in each shipment and the total pounds of fat received and the number of pounds of whey butter made each day.

21. Every person who manufactures or who sells whey butter wholesale shall keep a special book in which shall be entered the date of sale, purchase and shipment of whey

butter, the quantity so sold, purchased or shipped, the name and address of the person from whom it has been purchased and to whom it has been sold or shipped, and the name of the railway or steamship company or other transportation agency, by which such whey butter is transported.

22. Books and records required by the two preceding regulations shall contain no entries other than those required by the two preceding regulations and shall at all times be open for inspection by any inspector appointed under the authority of the Act.

23. (*a*) The Dairy and Cold Storage Commissioner shall keep a book to be called the Cheese Factories and Creameries Register, and every person, firm, corporation or association engaged in the manufacture of cheese, creamery butter, or whey butter shall, before January 1, 1924, apply to the Dairy and Cold Storage Commissioner, at Ottawa, Ont., for the registration of the cheese factory, creamery or combined cheese factory and creamery owned or represented by him.

(*b*) In case any person, firm, corporation or association establishes a factory or commences for the first time the manufacture of cheese, creamery butter or whey butter after the 1st January, 1924, such person, firm, corporation or association shall apply to the Dairy and Cold Storage Commissioner for registration in the manner above set forth before engaging in such manufacture.

24. Application for registration shall be in the form set forth in Schedule No. 1.

25. On receipt of particulars as set forth in Schedule No. 1, the Dairy and Cold Storage Commissioner shall send to the owner or representative of such cheese factory, creamery, or combined cheese factory and creamery, a certificate showing the registration number allotted.

26. On and after May 1, 1924, all packages containing cheese, creamery butter or whey butter, shall bear the registered number of the factory in which the cheese, creamery butter or whey butter was manufactured except in the case of prints of butter put up under the brand or trademark of a wholesale or retail dealer.

27. Any stencil, rubber stamp, or other device used to apply the registered number to packages containing cheese, creamery butter or whey butter, shall be in the exact form and size as set forth in Schedule No. 2 and with letters as described in Section 2 of these regulations.

28. No person shall erase or obliterate in any manner any registered number on any package containing cheese, creamery butter or whey butter.

29. Any person who violates any of the provisions of any regulations made under the authority of the Act shall for each offence, on summary conviction, be liable to a fine of not less than ten dollars, nor more than fifty dollars, together with the costs of prosecution.

30. Any pecuniary penalty imposed under these Regulations shall, when recovered, be payable and appropriated in the manner provided by Section 21 of the Act.

A NEW PUBLICATION

"Seed, Feed and Fertilizer Markets" is the title of a new periodical issued every two weeks by the Department of Agriculture at Ottawa. This leaflet emanates from the Seed Branch, which is responsible for the administration of the Acts regulating the trade in seed, feed and fertilizers. Information is given on current wholesale and retail prices, exports and imports, the retail feed market, registered seed, and other matters. In a foreword Mr. Geo. H. Clark, the Dominion Seed Commissioner, outlines the purpose of the periodical as follows:—

> "The service of periodical market reporting is authorized in respect of seeds, feeding stuffs and fertilizers, with a view to providing what would seem to be a desirable adjunct to the legal control of trade in these commodities. Ignorance is said to be the environment in which fraud flourishes. It is unfortunate that in Canada, as in most other countries, a substantial percentage of retail merchants and farmers have not as fully as could be desired associated prices with relative quality, and in consequence the tendency has been, to far too great an extent, to manufacture, distribute and use commodities of such inferior quality that their employment is wasteful.
>
> "It is hoped that by providing this market reporting service on as sound a basis as possible it will ultimately serve to beget confidence on the part of the interested public that will lead them to purchase and use materials on a sound economic basis.
>
> "In the preparation of these reports extensive work has been done over the past six months with a view, so far as possible, to eliminating the danger of presenting misleading information. The work is in direct charge of officers who have had good experience in trading as well as in the study of foreign and domestic markets and market reporting of these particular commodities."

THE LOBO APPLE

THE Silver Wilder Medal has been awarded by the American Pomological Society to the Dominion Experimental Farms for the Lobo apple, one of the many varieties of McIntosh Red parentage originated by the Horticultural Division. This medal, which is the sixth of its kind received by the Division, is given only for new fruit originations of outstanding merit.

The Lobo is an apple very similar to the McIntosh in outward appearance, flesh and flavour, but is ready for use about a month earlier, thus lengthening the season of apples of McIntosh type.

The Lobo apple is an open pollinated seedling of the McIntosh. Seed of the McIntosh was saved in the Horticultural Division of the Central Experimental Farm, Ottawa, in 1898, and was sown there in the fall of that year. The seed germinated the following spring and the young trees were set out in fruiting rows in the spring of 1901 One of these trees, afterwards called Lobo, fruited in 1906, and as it continued to be very promising after each year of fruiting, it was named Lobo in 1909.

It was propagated and sent out for further testing, and proved so promising in widely separated parts of

Eastern America that it was submitted to the Committee on Wilder Medals as a variety to precede McIntosh in season.

Following is a description of this fruit as grown at Ottawa:—

LOBO (McIntosh seedling): Above medium size; roundish conical; cavity medium depth, open, sometimes russeted; stem short to medium, stout; basin deep, narrow, almost smooth; calyx open; pale yellow, almost white, washed with bright crimson; predominant colour bright crimson; seeds medium; dots moderately numerous, grey, indistinct; bloom little, if any; skin thick, tough; flesh white with traces of red, fine grained, tender, juicy; core medium; subacid, sprightly, pleasant, good flavour; quality good; season October.

EGG-LAYING CONTESTS

The Fifth Canadian Contest

THE Fifth Canadian Egg Laying Contest commenced on November 1, 1923, at the Central Experimental Farm, Ottawa.

Little difficulty was experienced in the handling of the outgoing and incoming birds. Previous methods were adopted and, in spite of the fact that only one day intervened this year between the old and new contests, all was in readiness on the arrival of the birds.

Taken as a whole, the new contest is made up of excellent material, and in some cases the birds are considerably in advance of any previously received at Ottawa.

The Contest is again enlarged and ten additional pens now brings the total to eighty.

A widely spread area is covered by the entries, which are as follows: Ontario 59 pens, United States 6 pens, Alberta 4 pens, Quebec 3 pens, New Brunswick 2 pens, Nova Scotia 2 pens, Manitoba 2 pens and British Columbia 2 pens.

The eighty pens are made up of the following breeds: White Leghorns 42, Barred Rocks 30, White Wyandottes 4, and one pen each of Rose Comb Rhode Island Reds, White Rocks, Single Comb Anconas, and Single Comb Rhode Island Reds.

The Fourth Ontario Contest

The Fourth Ontario Egg Laying Contest commenced on Thursday, November 1, 1923. The contest, which is also conducted at the Central Experimental Farm, Ottawa, is restricted to the residents of the Province of Ontario, and this year it was again necessary to increase the accommodation. Forty pens are now provided and are made up as follows:—

White Leghorns 22 pens, Barred Rocks 13 pens, Single Comb Anconas 2 pens, and one pen each of White Rocks, White Wyandottes and Single Comb Rhode Island Reds.

The new birds are quite up to the standard of past years, and have every appearance of being likely to give a good account of themselves, so that interesting work may be expected during the coming year.

DISTRIBUTION OF VEGETABLE SEEDS

IN his annual report, the Dominion Horticulturist, Mr. W. T. Macoun, records that during the early part of last winter, 995 applications were received for seed of the varieties of vegetables under improvement in the Division of Horticulture of the Experimental Farms Branch. The applicants were sent samples for testing so far as the supply of seed would permit. While a large percentage of recipients of packages of seed reported their findings carefully, a smaller number made their reports too vague to be useful, and a large number failed to report at all. The clear reports received numbered 233, and the vague reports 179, while those who failed to make returns totalled 458. In addition to the general distribution in Canada, a reciprocal exchange of varieties was arranged by the Division with England, Russia, China, and Central America.

PART II

Provincial Departments of Agriculture

THE HORTICULTURAL SERVICE OF THE QUEBEC DEPARTMENT OF AGRICULTURE

By J. H. LAVOIE, Director

Historical Notes

NOTWITHSTANDING that the cultivation of domestic fruits of European origin had been introduced into this country at the time of the arrival of Louis Hébert at Quebec in 1617[1], it was only from the year 1892 that the Provincial Governments of Quebec seriously undertook to work for its extension. Up to that time, the degree of development that it had attained was due to private initiative and to the scattered efforts of a few horticultural societies[2]. The first marked government impulse was given to fruit culture by the Hon. L. Beaubien, Provincial Commissioner of Agriculture, in 1893, for whom the way had already been prepared by such illustrious forerunners as Provencher, Morissette, Dupuis, Guilbault, Chapais, Mignot, Gill, Archibald, Rhodes, Fisk, Shepherd, Brodie, etc. It manifested itself by the establishment of small model orchards[3], and by the opening of a practical school of arboriculture at the establishment of the Trappists, at Oka[4], which considerably increased the area of fruit plantations, especially in the district of Montreal. To this phase of development succeeded that of the improvements brought to the cultivation of fruit by the Pomological Society, founded in 1893, to watch over the destinies of the young Quebec Pomona. It was at its instigation that the Ministers of Agriculture established, in 1898, the first six fruit stations, and in 1911, the first four demonstration orchards, and upon that occasion, appointed, for the first time, officers whose special duty was to occupy themselves with inspection and demonstration work.

It remained to the Honourable Mr. Caron, the present Minister of Agriculture, to complete the work commenced and prosecuted under such happy auspices, by establishing, in 1914, an administrative service, whose sphere of activity was to extend throughout the Province, whose functions were to give advice on questions referred to it by the ministerial authorities, and whose mission was to secure information from the most authoritative sources, to popularize it, to group the scattered elements of progress so as to assure their utility, and thus to work efficiently and incessantly for the advancement of fruit, vegetable, flower, tobacco, and potato cultures and industries.

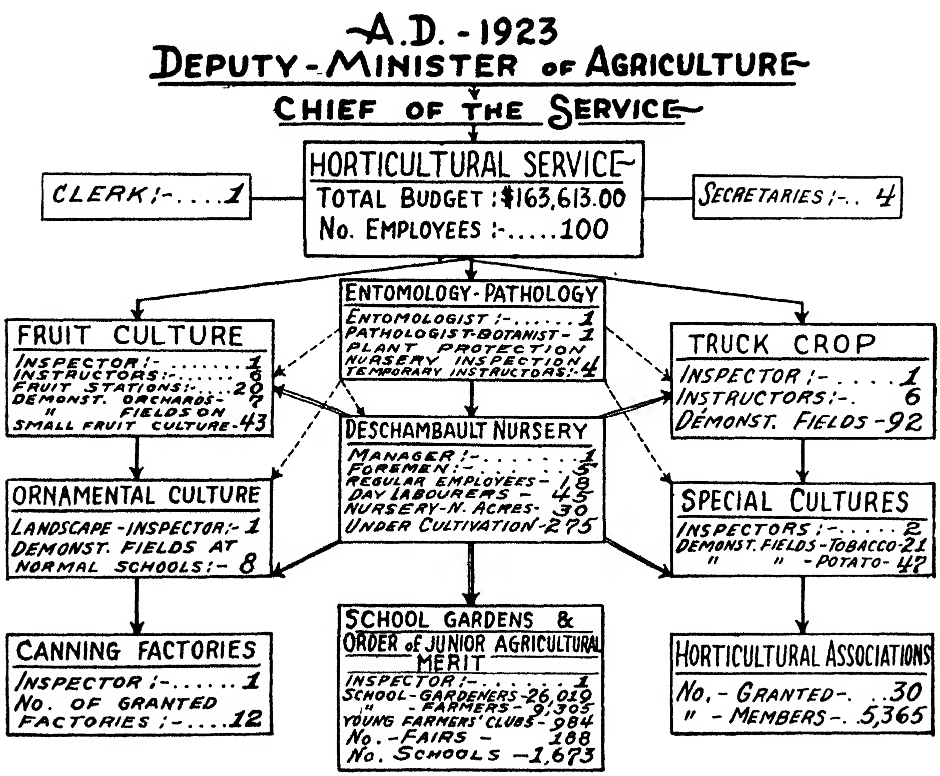
Organization and Functions

This service known as the Horticultural Service includes at present nine sections namely: (1) Fruit culture; (2) Truck crops; (3) Ornamental culture; (4) Special cultures; (5) Entomology-Pathology; (6) the Deschambault Nursery; (7) Food canning; (8) School gardens and the Junior Order of Agricultural Merit; (9) Horticultural Associations.

It is composed of thirty-one officers, including one head, one ento-

mologist, one botanist-pathologist, one nursery manager, eight inspectors, thirteen instructors, one clerk and four secretaries.

The organization of the Service, from the point of view of the connection and of the extension of the sections, of the distribution of the personnel and of the budget, may be represented by the following sketch:—



Upon the head of the Branch devolves the daily task of following the interior and exterior development of horticulture in the way of experiments, discoveries or improvements, as well as in the administrative organization; to keep himself constantly in touch with the conditions of supply and demand, as well as of those of transportation; to obtain the fullest information upon the cultural possibilities of the different districts of the Province and upon the cost of producing the various crops in each district; to advise the ministerial authorities of the present and prospective conditions that may influence the chief factors of production and sale; to report to them upon the manner in which horticulture is administered and directed, and to suggest to them such modifications as are necessary to obtain the best results; to organize the different sections of the Branch in such a manner as will enable each of them to attain its maximum of efficiency; to direct, to co-ordinate and control the activities of the members of the staff; to arouse their spirit of initiative and to encourage their efforts.

To the entomologist and the botanist-pathologist are assigned functions analogous to the preceding, since their duties oblige them to be in constant relationship with the developments

occurring in each of their respective domains, both within and without the Province, and which, therefore, the organization of their section imposes upon them. They are required to test new experiments which may have succeeded elsewhere; to popularize the knowledge and to demonstrate the efficacy of the best preventive and curative methods for the protection of plants against disease and destructive insects; to direct the work of their subordinates, and to conduct laboratory work; to make an annual inspection of nurseries and to give them the certificates provided for by law; to identify specimens that may be sent to them; to mount botanical and entomological specimens, etc., for the teaching of natural history in the primary schools.

To the inspectors of small-fruit, flower, tobacco, and potato growing are confided the oversight and the responsibility of the fruit stations, the demonstration fields and orchards, which they are required to visit at least once a fortnight, from February to December. At these inspection visits, of which they give notice in advance, they give, at the home of each of the managers, demonstrations for the benefit of the producers of the locality. Between times, they have to verify the account books kept by each of the managers and to transmit to us the financial statements with their reports at the end of the year; to prepare lists of the material required at each of these establishments for the following year; to notify us at once of any of the managers who do not give satisfaction, and to keep us informed upon the efficacy of the methods and material employed, upon the particular conditions of production and sale in their respective districts, and upon the modifications and improvements which they believe it to be opportune to introduce in administration; to give, during the winter, in the neighbourhood of towns and industrial centres, series of short courses, illustrated by lantern views, upon different horticultural subjects.

Upon the inspector of school gardens devolves the duty of packing and shipping some 300,000 packets of seeds and seed grain sent, each spring, from the Deschambault nursery, as well as the sending of the prizes in kind, won, during the previous year, by the best farm pupil of each of the districts having an official agriculturist; to see to the distribution of directions for cultivation; to assist the official agriculturists in the inspection of household gardens, and in the organization of school exhibitions; to visit the plots cultivated by the competitors in the Junior Order of Agricultural Merit; to adjudge the prizes; to superintend and to assure the efficacy of the results produced by these gardens at the localities where they are established.

To the inspector of canned foods is confined the care of initiating new instructors in the manufacturing of domestic canned foods and to supervise their work; to furnish upon request to those who wish to establish factories for canned foods necessary information and full directions as to the possibilities of success; the nature and the capacity of the necessary apparatus, also as to the plans of construction and management of the factory, as to the total cost of the enterprise and the possible cost of running the factory; to visit annually the factories in operation which receive grants from the Department with a view of contributing to the improvement of the quality of the products.

The instructors are to give demonstrations at the homes and also public demonstrations on cultivation of various kinds and industries connected with cultivation; to collect annual statistics of the different horticultural productions; to pay individual visits to the members of

the horticultural societies at least twice a year; to aid in the organization and the holding of standing crop competitions and of horticultural exhibitions; to assist official agriculturists in everything relating to school gardens.

The aim and the development of our activities bear principally on the expansion of the cultivation of fruits, vegetables, flowers, tobacco, and potatoes for the purposes of domestic, commercial and industrial utilization; on the concentration of these different productions at localities most favourable to their commercial and industrial extension; on as complete a supply as possible of our centres of consumption by local production; on the education of the producer as to the choice of the most desirable species and varieties, and as to methods of cultivation, of selection, of classification and of packing, best calculated to satisfy different requirements and to diminish the net cost; on the propagation of species and varieties; on the organization of the sale of the products; on the industrialization of horticultural products; on the education of the consumer relative to the disposal of our productions and to the varieties in which it is in his interest to ask for; lastly, upon the improvement of food supply in the country districts by domestic canning, and by the embellishment of homes through the cultivation of ornamental plants and flowers.

The means of popularizing to which we have recourse for the realization of this programme may be summarized as follows: propaganda by lectures, publications and house to house visiting by our inspectors; demonstrations of every kind and principally by the establishment of fruit stations destined to determine cultural possibilities, demonstration fields and orchards destined to show the efficacy of recommended methods and the profits realizable from each of these cultures; the granting of generous subsidies: (*a*) to horticultural associations for the holding of competitions or exhibitions; (*b*) to the manufacturers of canned foods for the improvement of their products; (*c*) to individual producers by the purchase of costly machines of great capacity, such as power sprayers, dusters and sorters; the organization of school gardens and of Junior Order of Agricultural Merit competitions, destined to form a progressive agricultural spirit among our rural youth, by furnishing at an early age the opportunity of becoming familiar with the best methods of elementary culture, and in stimulating its emulation by attractive prizes; the multiplication and sale at moderate prices of fruit-trees and shrubs, of hardy and true-to-name varieties, to the members of the different agricultural associations of the Province.

Some Results

Fruit stations have not only shown cultural possibilities, but, above all, they have contributed to render the production of fruit more general.

The demonstration orchards have proved that the net profits from orchards about twenty years old, may vary from $210 to $600 per acre.

The demonstration fields have proved, first, that 1,720 pounds of tobacco per acre may be obtained in localities where only 1,300 pounds were produced hitherto;

Second, that the potato crop may be increased from 200 bushels to 550 bushels per acre;

Third, that the culture of small fruits has produced net profits of $226 to $720 per acre;

Fourth, that truck crops have produced net profits of $135 to $560 per acre.

One of the rural canning factories which we aided in establishing last

70305—3

spring has realized this autumn a net profit of $1,750 for two car loads of manufactured produce.

During the last five years, we have directly contributed to the plantation of 250,000 fruit trees and of 3,000,000 fruit shrubs and small fruit plants.

In the course of the last fiscal year we have contributed financially 25 per cent of the cost of purchase of 27 power sprayers.

Finally, we have been able to ascertain that those who are now deserting the soil of the Province of Quebec are not the fruit and truck crop growers, and for good reasons.

---

(1) "Sieur Hébert planted some apple trees during his lifetime, which have borne some very good fruit, as I have been assured, but the cattle spoiled these trees".

(*Relations of the Jesuits.* Letter of P. LeJeune, at Quebec, in 1636, volume 1 x page 154).

(2) "Horticultural Societies of Montreal.

"Horticultural Societies of Quebec.

"Horticultural Societies of Missisquoi.

"Horticultural Societies of Rouville.

"Horticultural Societies of Shefford.

"Horticultural Societies of Brôme.

"Horticultural Societies of L'Islet.

(3) "Here is a considerable industry (that of the apple.) I propose to strongly favorise it. Next spring, I shall entrust to all the members of Parliament a certain quantity of fruit trees and I beg of them to make model orchards of these trees for the counties."

(4) "To favorise and spread it, I established an arboricultural school at the Monastery of the RR. FF. Trappists, at Oka, where the fruit and forest tree cultures, the pruning and grafting, the confection of wine and fruit preserve will be taught gratuitously."

(L. c. Honourable Beaubien, March 11, 1893).

(5) "The wild apple-trees, and those that are raised from seeds bear very fine apples. The peach trees produce abundantly, but like the vine—that is, the fruit is all on the ground, because the tree has to be covered with straw or other protection until the month of April, lest it freeze. The pear-trees are more delicate; I saw one that blossomed twice last year—once in the spring, and once in the course of the summer. This year we saw an apple-tree loaded with large apples in June, which had one branch all in blossom. The cherry-trees bear hardly any fruit; they do nothing but blossom and shoot out branches and roots—in such numbers that a forest of trees grows up at their feet, but the people do not know how to keep them down. There are black plums resembling black damsons, which remain on the trees during the winter and are excellent eating in the Spring.

"There are quinces that are fairly good, but the tree grows like the peach-tree and has to be covered during winter."

(Letter of F. Chauchetière to his brother, Ville-Marie, August 7, 1694. Jesuits' Relations. Volume LXIV. Pages 133 and 137.

THE PROGRESS AND TREND OF AGRICULTURE IN BRITISH COLUMBIA

By WM. J. BONAVIA, Secretary, Department of Agriculture

THE steady progress of the agricultural industry in the Province of British Columbia can be well shown in its broader outlines by a comparison of the records of acreage under crop, the production over a series of years, and an analysis of the imported agricultural products.

Official agricultural statistics are available from the year 1910, and for the purposes of illustration the years 1910 and 1920, a decade apart, and the present year (1923) will be dealt with so far as possible, the fluctuations of the war years being thus eliminated.

FIELD CROPS

COMPARISON OF CROP AREAS AND YIELD YEARS, 1910, 1920 and 1923

—	Year 1910		Year 1920		Year 1923	
	Area	Yield	Area	Yield	Area	Yield
	acres	bush.	acres	bush.	acres	bush.
Fall wheat	4,369	206,070	13,762	264,918	13,500	378,000
Spring wheat	5,133		32,453	608,493	31,400	816,000
Oats	33,209	1,701,533	47,992	1,667,722	59,200	2,990,000
Barley	1,853	51,509	9,646	364,136	7,000	242,000
Spring rye	370	5,658	5,367	138,200	7,600	177,000
Peas	1,572	43,979	2,657	69,082	2,300	57,000
Beans	347	5,346	1,615	32,300	1,100	22,000
Mixed grains	526	12,802	4,893	176,148	5,300	204,000
		tons		tons		tons
Potatoes	10,872	48,936	17,780	88,011	19,400	115,100
Roots	2,312	25,395	7,403	80,470	7,200	73,450
Hay and Clover	133,317	208,499	127,017	254,034	148,000	333,000
Fodder corn	355	3,940	4,713	54,199	4,600	50,000
Alfalfa	3,741	11,223	13,478	40,434	16,500	58,000
	197,976	2,324,890	288,776	3,838,147	323,100	5,515,550

It will be seen from the above table that in practically every case the increase in area under field crops has been substantial, not only during the ten-year period, but subsequently also. Notable increases are recorded in the acreage under oats, mixed grains, hay and clover, fodder corn and alfalfa. Peas and beans show a decrease since 1910. The total increase between 1910 and 1923 for acreage under field crops is 63 per cent.

Whilst making due allowance for seasonable variations, there is evidence also, owing no doubt to better methods of cultivation, proper rotation and seed selection, that the yields per acre are well maintained in the majority of field crops. The following figures amongst others are of interest in this connection:

Crop	Average to 1920	Year 1923
	bush.	bush.
All wheat	23·25	26·50
Oats	48·50	50·50
Beans	18·50	20·00
Mixed grains	36·0	38·50
	tons	tons
Potatoes	5·4	6·21
Alfalfa	2·95	3·50

The figures relating to the importation into British Columbia of agricultural products from other provinces in Canada, as well as from foreign countries, also bear out the progress made by this province in becoming more self-supporting, as will be seen from the attached table:—

—	Year 1910	Year 1920*	Year 1922
(a) Agricultural products imported into British Columbia from other Provinces in Canada, showing percentage for the year....	$12,833,593 or 43·6 p.c.	$18,902,981 or 19·8 p.c.	$12,970,001 or 18·0 p.c.
(b) Agricultural products imported into British Columbia from foreign points, showing percentage for the year.	2,353,632 or 7·8 p.c.	7,913,488 or 8·2 p.c.	4,173,321 or 5·7 p.c.
(c) Home production, showing percentage for the year	14,398,990 or 48·6 p.c.	68,926,090 or 72 p.c.	55,322,971 or 76·3 p.c.

*The year 1920 was one of high post-war values.

NUMBER OF FARMS AND ACREAGE

The Dominion Census figures show that the number of occupied farms of one acre and over in this province has increased from 16,958 in 1911 to 21,973 in 1921, whilst the total farm acreage was increased during the same period 12·6 per cent.

The average size of farms is still decreasing, although not to the extent generally credited; in 1911 the average size of a holding was 149·8 acres and in 1921 130·2 acres. There has also been an increase during the period amongst farms from 11 to 50 acres in extent with a considerable decrease in those under 5 acres.

DAIRYING

The dairy industry in British Columbia, while still of no great magnitude, can show a remarkably steady development for the past twelve years.

There exist now within the Province thirty manufacturing creameries, three cheese factories, three condenseries, and several plants devoted solely to the manufacture of ice cream. Several of the creameries are still doing only a small business, having been recently established, with Departmental assistance, in the newer portions of the country, but without exception they show signs of coming prosperity with the speedy reduction of manufacturing costs under an increased make.

There is in Canada no country better adapted for dairying than the agricultural portions of British Columbia. In districts varying in altitude and precipitation, corn, roots, alfalfa, red clover, and various silo mixtures yield tonnages not obtained elsewhere.

The four main breeds of dairy cattle are represented: Holsteins, principally on the Lower Mainland, Jerseys and Guernseys on the Lower Mainland and on Vancouver Island, with Ayrshires here and there throughout the Province, to the interior parts of which this breed is specially adapted.

Cow-testing associations and cow-testing centres have been for several years in operation, mainly with grade herds, and good progress has been made. The average of all completed lactation periods recorded during 1922 showed a yield of 7,073 pounds milk and 316 pounds butterfat.

Prices for dairy products are uniformly higher than in more eastern provinces owing to British Columbia being still an importing province. Several million pounds of butter and considerable cheese come in annually from without. Production is, however, steadily increasing, but good markets within are assured for years.

The total dairy production for 1910 was valued at $3,645,405; for 1922 at $8,001,135.

Splendid opportunities exist for intending dairy farmers to locate on the newer lands of the Province in Central British Columbia, especially in the settlement areas administered by the Land Settlement Board.

LIVE STOCK

In examining the records for live stock over a series of years, the outstanding features are the steady increases in dairy cattle and poultry. The following figures are of interest:

1911—Dairy Cattle 33,953
1920—Dairy Cattle 94,816
1923—Dairy Cattle 117,143

In horses and beef cattle there have been fluctuations; the total number of horses increasing from 57,415 in 1911 to 65,000 in 1916, then declining through a series of years; horses are, however, again on the upgrade, a total of 54.017 being recorded for the present year.

Beef cattle also reached their peak in 1916 with a total of 170,000; poor markets of the past few years, however, have reduced the total to 147,001 for the present year, the lowest since the year 1918.

Sheep and swine figures have been fairly consistent, the sheep showing a small but steady increase, but swine at present are at a low figure in accord with recent market tendencies, as follows:

	Sheep	Swine
1911	39,272	33,604
1920	46,473	44,010
1923.	53,336	42,845

CATTLE

Exceptionally favourable crop and pasture conditions caused a more hopeful feeling in the live stock industry during the past year. Throughout British Columbia there was an excellent rainfall during the growing season, which resulted in an unusually heavy hay crop, and this will enable the live stock men to better cope with market conditions. Some beef cattle were shipped out of the range districts unusually early, and shipping continued during the remainder of the season. All cattle were in splendid shape in the fall. During a season of poor pasture on the range, cattle must be held to get all the flesh on them that is possible, and a short supply of winter feed causes a glut on the market in the fall. Fall calving dairy cows were selling at an advance of 15 to 20 per cent over last year, with a somewhat keener demand for all classes of dairy stock.

SHEEP

The sheep industry is in a very healthy condition. Mutton is a good price and lambs have brought considerably better prices than a year ago, which is satisfactory to the producers. The wool market is strong and as high as 20 cents per pound is being paid by local buyers. Shippers to the Canadian Co-operative Wool Growers' Association expect to secure a better price than that quoted.

HOGS

The hog market has shown a downward tendency, but even at present prices hogs can be produced at a profit. There has been a keen demand for weanling pigs.

HORSES

Aside from a good demand for big drafters, the horse market is very quiet. Breeding operations are being restricted this year because it is felt that unless a farmer has large drafty mares he cannot afford to raise colts.

GOATS

While goats have suffered in common with cattle from the all round depression in prices, they have held their own remarkably well. Easier prices during the past season have meant the better distribution of goats, the keeping of which is steadily on the increase, and the number in the province to-day is probably over nine thousand. The policy of assist-

ing in the importation of high-class milk stock, and especially of pure-bred bucks, has resulted in a gradual bettering of the quality of the goats in the province, and it is probable that in the near future a system of certifying milk yields will be put in force as well as the licensing for public service only of pure-bred bucks of approved milk ancestry and of good conformation. This will tend to maintain the quality of the stock at a high level and will also tend to better prices.

POULTRY

The poultry industry has after a series of strenuous years shown a big annual increase since 1918 as follows:

Year	Total Poultry
1918.	1,001,806
1920.	1,340,082
1923.	2,165,516

The forward movement in production and egg marketing during 1922-1923 is outstanding.

This year weather conditions during the hatching season were far from favourable, but despite this the young stock grew remarkably well and, in many cases, through being hatched too soon, birds were laying before the period of high prices; such fowls in almost every instance go into moult at the beginning of winter.

Owing to the poor demand for hatching eggs in the spring prices obtained were the lowest since the spring of 1915. Co-operative associations and independent shippers took advantage of the low prices to export nearly three-quarter of a million dozen eggs out of the province. Included among these was a car-load of eggs sent to Glasgow, Scotland.

Up to the end of the poultry year, which is October 31, the wholesale average price for eggs was 28½ cents for the year, being possibly the lowest price received for the past fifteen years.

Quite a few poultry breeders went out of business and many others reduced their breeding flocks to the minimum. This forced a large quantity of dressed poultry on to the markets and, as a consequence, lowered the price somewhat.

Fewer ducks and geese were raised last year, but for turkeys the season proved almost as good as the last. Prices are likely to be lower this year, however, as cold storage stocks show a large increase over the same period last year.

With the bumper wheat crops in practically all parts of the Dominion, poultry breeders are facing the new year with slightly better prospects than recently, especially as the egg grading regulations have been put into force. These regulations have been the means of checking a certain amount of American importation, and have guaranteed better prices for the heavier and higher grades of eggs.

FRUIT GROWING

The early records of fruit growing in British Columbia are limited. It is on record that Sir James Douglas, Governor of the Colony in 1851, planted many apple trees in the vicinity of Victoria, and ten years later he is mentioned among the exhibitors at the first agricultural exhibition held in the province. Apples were also on view at the first agricultural exhibition held at New Westminster in 1867.

The date of the beginning of fruit growing in the interior valleys is harder to determine. Plantings apparently were made as far back as 1864 at Penticton; commercial plantings, however, were probably not made much before the early eighties, when large orchards were set out at both Kelowna and Vernon.

Since that time the industry has advanced rapidly and the following figures will give some idea of the increase:

Year	Number of Trees
1891, Estimated	450,000
1901, Census	649,091
1911 "	2,677,486
1921 "	2,694,538

There is very little difference shown by the figures given in the 1911 census and the 1921 census. It is well known, however, that large acreages were planted between 1911 and 1914, in locations unsuited to tree fruits, the result being that many acres did not make satisfactory growth and never reached the bearing stage, thus accounting for the fact that the 1921 figures do not show a marked increase. There is no doubt, however, that future plantings will be in areas suited to fruit production and that such plantings, while not as heavy as those of the past, will be more safe and sane.

As regards the production of fruit, figures do not show a very large increase until after 1915.

The attached table relates to *boxed fruit production* only:

Year	Quantity	Value	Increase during period
	boxes	$	boxes
1890	122,120	.....	....
1900	343,533	436,000	221,413
1910	789,739	1,000,335	446,206
1915	953,700	1,352,387	163,961
1920	2,243,724	4,668,486	1,290,024
1922	4,173,376	3,761,730	1,929,652

Increased acreage and production are also to be found in the small fruits. According to the Dominion Census of 1911, there were 1,336 acres devoted to the growing of small fruits. This acreage as shown in the Census of 1921 was 6,319, an increase of 375 per cent.

Regarding the value of the fruit and vegetable crop; official records show a total of $1,939,110 for the year 1910 and $4,915,604 for 1922; the latter figure was, however, 24 per cent less than the record for 1921 due to low values.

CO-OPERATION

No account of the progress of Agriculture in British Columbia would be complete without reference to co-operative work, and in particular to co-operative fruit marketing. There have been periods of enthusiasm for co-operation as far back as the "nineties," when numerous organizations were formed, of which only one is in existence at present (the Vancouver Island Flockmasters' Association). The large majority of the present associations date from the year 1913, being formed under the provisions of *The Agricultural Associations Act* of 1911 and amendments, subsequently merged into *The Co-operative Association Act* of 1920.

The following figures are revised to date:

(*a*) Fruit Growers, Fruit Shippers and Miscellaneous Co-operative Associations handling horticultural products	70
(*b*) Co-operative Associations operating stores in rural communities	81
(c) Live Stock Associations	32
(*d*) Creameries	13
(*e*) Farmers' Institutes	143

With regard to (a) the horticultural industry, it is noteworthy that no less than twenty organizations have been incorporated this year due to the fillip given to co-operation by the visit of Aaron Sapiro to the Province in the early part of the year in the interests of co-operative fruit marketing; the majority of these new associations being linked up with the Associated Growers of British Columbia with headquarters at Vernon.

Most of the fruit sold in the province is now marketed through co-operative channels. In the small fruit districts it is safe to say that 75 per cent of the fruit at least is marketed co-operatively, while in the tree fruit districts probably 85 per cent reaches the market through co-operative channels. Co-operative marketing has always been an important factor in the selling of British Columbia fruit and now that the production of tree fruits has increased in the last seven years by approximately 85 per cent, it has become more evident that this form of marketing is the only practicable system. The same may be said with regard to the marketing of small fruits. Not only do the growers of small fruits realize the advantages of co-operative marketing, but it has also been the means of convincing them that a more satisfactory handling of berries was essential. The result has been the establishment of pre-cooling plants in the chief small fruit centres. By this method of handling, the grower is enabled to put his fruit on the distant prairie markets in first class shape, and a wider market has been assured. In this country, as in every other, the co-operative system is subject to considerable criticism. The principle, however, remains sound, and it undoubtedly will always be the means through which the larger percentage of British Columbia fruit will be marketed.

(c) About twenty per cent of the Farmers' Institutes engage in business for their members, some of the figures supplied to the Department being of great interest, showing the wide range of commodities handled. The following items are taken at random from the year 1922:

Bella Coola F.I.	Feed, oil, fertilizer, etc	$8,864 61
Surrey F.I	Stumping Powder, fuse and caps	8,756 90
Kitsumkalum F.I.	Feed, Hay and Fertilizer	3,253 00
Squamish F.I.	Building materials for a hall	768 72
Arrow Lakes F.I	Fruit boxes	669 80

The Crawford Bay Farmers' Institute, which runs a general co-operative store for its members, made sales amounting to $14,292.53.

In reviewing the whole agricultural situation it may be safely said that the era of specialization along any single line is recognized as having been a mistake and that the trend of agriculture in British Columbia will be along mixed farming lines, with an immense development of the dairy industry in the near future.

DAIRYING IN SASKATCHEWAN

By PERCY E. REED, Dairy Commissioner

SASKATCHEWAN, the largest of the three prairie provinces, is located in the centre of the Canadian prairies. The province extends from the international boundary on the south to the sixtieth parallel on the north, a distance of 760 miles. It is bounded by the provinces of Manitoba on the east, and Alberta on the west, and is 393 miles wide at the southern boundary and 277 miles at the 60th parallel.

The land area of Saskatchewan is 155,764,480 acres and the water surface 5,323,520 acres. Of the above land area approximately 93,000,000 acres are arable.

The province has a population of 760,000, of which more than 72 per cent are resident on the land. The last federal census, 1921, reports the province as having 126,436 occupied farms, though only about one-third of the land suitable for agricultural purposes is yet under cultivation.

A Grain Growing Province

By natural adaptability of both soil and climate Saskatchewan is peculiarly suited for grain production, and until quite recent years the agricultural activities of the people, outside the areas where stock raising was carried on, were almost exclusively confined to grain growing. Saskatchewan produces approximately 60 per cent of the total wheat of Canada, and in 1922 her production of this commodity was 250,167,000 bushels. Wheat is and will for years continue to be the chief crop of the Saskatchewan farmer, but other grains and also forage crops are grown to a high degree of perfection in practically all parts of the province. Conclusive evidence of the outstandingly high quality of Saskatchewan grains is found in the fact that out of a total of eleven sweepstake awards for the world's best wheat offered in convention with International Grain Shows and Soil Products Exposition held in United States, nine have been won by Saskatchewan growers. At one of the eleven shows, Saskatchewan was not represented. Six out of eleven similar world sweepstakes for oats have also been won by Saskatchewan grown exhibits.

Progress in Dairying

Dairying, though still an infant industry in Saskatchewan, has in recent years made very rapid progress. With miles of the most fertile open prairie waiting for the plough, where there were neither stones nor trees to interfere with cultivation, grain growing naturally came first and for years after the province received its autonomy—which was not until the autumn of 1905—there was not sufficient milk, butter or cheese produced to supply home requirements. Here, as elsewhere, however, a one-crop system of farming is hazardous, and with permanent settlement came the dairy cow and the dairy manufacturing plant to supplement grain growing.

During 1906, the first year for which provincial statistics are available, there were only three creameries in operation with a total output of 132,446 pounds. In 1918 the creamery output exceeded 5,000,000 pounds, and during the five year period, 1918 to 1922, the make increased more than 80 per cent, so that in 1922 over 9,000,000 pounds of creamery butter was produced.

Government Grading of Butter

In a province where nearly 75 per cent of the population are agricultural producers, it was evident that markets for the product must be found outside, and accordingly in our dairy development every attention has been given to meeting the requirements of the export market.

In 1913 a system of government grading of butter was instituted, and in 1914 the issuing of government certificates of quality was adopted. This service originally was intended to be chiefly educational, and was calculated not only to improve the quality of the output, but also to develop uniformity in the butter manufactured in all parts of the province. The commercial importance of the service and of the grade certificate, however, was soon evident and has been an important factor in developing the work, as the more discriminating markets have in recent years refused to accept carlot shipments unless covered by government certificate. To encourage the general grading of the creamery output, the provincial government has continued to furnish the butter grading service without charge, and in 1922, 90·7 per cent of the entire creamery output was scored by the official government graders. The butter grading service is administered by the

Dairy Branch of the Department of Agriculture, and the men in charge of the grading are not only experts in butter manufacturing but also keen students of market requirements. Through the operation of this service, Saskatchewan creameries are to-day delivering to the world's markets a standardized product of very uniform quality.

The importance of the export trade to the dairy industry of Saskatchewan is evidenced by the fact that during 1922 there were 224 car loads —56 6 per cent of the total creamery output—shipped out of the province under government grade certificate.

Cream Bought on Quality Basis

The quality of the butter necessarily depends to a great extent upon the quality of the cream from which it is manufactured. In view of this, the purchase of cream on a grade or quality basis has also been in practice since 1913. This grading, however, was carried on only by mutual agreement amongst the creamery operators until the present year.

For the season of 1923, the provincial government was requested by the dairy interests, both producers and manufacturers, to make the purchase of cream on a grade basis compulsory. Accordingly legal standards were fixed for five grades of cream and a staff of trained men appointed as official government graders and, attached to the staff of the Dairy Branch of the Department of Agriculture, were placed in the creameries of the province to grade the cream as received. These officials are also responsible for the checking of weights and of butterfat tests on cream received, and for seeing that correct settlement is made with the patron. This system must have the effect of greatly improving the average quality of the cream delivered as well as inspiring confidence in the minds of the lairy producers.

Co-operative Development

Co-operative endeavour has been a prominent feature in connection with Saskatchewan's dairy development. In the early years, owing to sparse settlement and small dairy herds, the province did not offer an inviting field for private investment in the creamery business. The establishment of creameries was, however, essential to exclusive dairy development, and the provincial government came to the aid of the dairymen by lending generous financial assistance to local associations of farmers in the establishment of creameries at suitable railway points where the manufacture of the product from a large territory could be centralized. This assistance was granted under special legislation passed in 1906. Sixteen associations organized and built creameries under this system. In 1917 these associations were, at the request of the shareholders, amalgamated by legislative enactment, so as to form a provincial organization known as the Saskatchewan Co-operative Creameries, Limited. This company has since made great progress in developing both the butter and produce business, and now owns and operates 28 creameries and seven public cold storages. During 1922 this farmer-owned co-operative company manufactured 42 per cent of the creamery butter output of the province, and also handled a large proportion of the eggs and poultry produced.

Private Creameries

While the co-operative movement has made remarkable progress in dairying lines in Saskatchewan, private enterprise has also done much toward the development of this branch of agriculture. There are now 36 privately-owned plants in the province, making a total of 64 creameries in operation, which during 1923

manufactured approximately 11,000,000 pounds of butter.

Possibilities Unlimited

Apart from supplying the requirements of the local milk and cream trade, dairying activities in Saskatchewan have been chiefly devoted to creamery butter. The ice cream business, though small, is developing rapidly, but to date little has been done in cheese, there being only four cheese factories in the province. During 1922 there were less than 30,000 farmers who were patrons of any dairy factory or milk plant. and on thousands of farms not even a family cow is kept. There are millions of acres of the most fertile and highly productive prairie lands still untouched by the plough. Less than one-third of the arable land of the province is settled. Yet the entire arable area is well suited for dairying, and all authorities agree that there should be a few good cows on practically every farm.

The above facts are evidence that only the fringe is being touched, and, as yet, Saskatchewan's dairying possibilities are practically undeveloped. But the industry has been established on a sound basis, with quality and uniformity in the finished product as the watchwords, and a fairer field for development of dairying work in either production or manufacturing would be difficult to find.

AGRICULTURAL REPRESENTATIVES IN SASKATCHEWAN

By F. H. AULD, Deputy Minister of Agriculture

SINCE Ontario undertook several years ago to place graduates of the Ontario Agricultural College in the Counties of Ontario to assist farmers in tackling special problems relating to agriculture, there has followed a general acceptance of the plan in some form or other in all of the provinces. The "County Agent" in the United States has become equally well known and equally popular, and the benefits accomplished through such agencies have established such service upon a sound basis.

In Saskatchewan a beginning was made in this work in 1914, when four graduates of the Manitoba Agricultural College were engaged to open up work at Shaunavon, Swift Current, Rosetown, and North Battleford. The situation was such, however, that the service was discontinued through the enlistment of two members and the utilization of the services of the others in other ways. In 1922, however, it was arranged to have five graduates take up work in the Local Improvement Districts in Southern Saskatchewan. P. H. Ferguson, B.S.A., was located at Maple Creek to work in Local Improvement Districts 112, 140, 170, and 227. J. A. Gray, B.S.A., was located at Robsart to cover Local Improvement Districts 20, 50, 80 and 81. D. G. Fidlar, B.S.A., worked Local Improvement Districts 21, 22, 52 and 82 from Robsart. L. M. Ogilvie, B.S.A., with headquarters at Cadillac worked 16, 17, 47 and 48, and Geo. F. Boyd, B.S.A., worked 13, 43, 14 and 15 from Limerick.

As a preliminary to more intensive work, a detailed survey was made of the occupied farms in these areas in order to establish the facts as to the class of soil encountered and the methods of farming which were being followed. A census of live stock was taken as well as data re acreage under cultivation and in crop. In addition, however, the Agricultural Representatives directed the grasshopper cam-

paign in their respective districts and endeavoured in a variety of ways to be of service. Following is a summary of their activities for the first year: promotion and supervision of co-operative experiments with corn, sweet clover, oats in rows, brome and rye grass; distribution of gopher poison in the Local Improvement Districts; investigation of crop pests including cutworms and grasshoppers and institution of control measures; weed investigation; inspection and scoring of seed plots for members of the Canadian Seed Growers' Association; judging standing crop competitions; promotion of co-operative live stock shipping; culling of poultry flocks; organizing live stock improvement associations and assisting in the introduction of brood sows of bacon type; investigations for the Debt Adjustment Bureau; and the holding of 98 extension meetings with a total attendance of 3,615 persons.

PLANT IMPROVEMENT IN ONTARIO

By DR. C A. ZAVITZ

THE Government of the Province of Ontario furnishes information which shows that the average yearly increases in acre yields of barley, oats and winter wheat in the province for the last twenty-one years, in comparison with the years previous, amounted to a total of 249,730,411 bushels which, valued at average market prices, reached a total of $161,049,877.71. This amount is sufficient to pay the whole cost of maintenance of the Ontario Agricultural College during its entire history of nearly fifty years and also to continue the institution at its average cost of maintenance for an additional fifteen hundred years, or until the year 3423.

It should be noted that these increases in yields per acre have been made in spite of a natural tendency towards steadily decreasing acre yields in a comparatively new country where commercial fertilizers are seldom used with farm crops.

The Ontario Agricultural College has been the great factor in bringing about these increased acre yields of field crops of high quality on the individual farms. About 2,500 varieties of field crops obtained from different parts of the world have been grown under test and their yields and characteristics carefully studied for at least five years. From some of the varieties of greatest merit, improved strains and varieties have been obtained through careful selections from large nurseries planted by hand with thousands of selected seeds. As a last resort, controlled cross-fertilization has been used to originate new varieties superior to those obtained through selection from the varieties of highest record. For some time past, about 50,000 hybrid plants of farm crops have been grown and studied annually at the College. The plant improvement work has included several classes of cereal, forage, root, and tuber crops. In this short article, reference will be made only to barley, oats and winter wheat, the three principal small grain crops of the Province.

Barley

The average increase per acre of 17·44 per cent of the barley crop of Ontario for the years 1902 to 1922 inclusive, as compared with former years, was brought about largely by the distribution from the College to Ontario farmers of the Mandscheuri barley in 1892 and the O.A.C. No. 21

in 1906. In the experiments at the College, the common six-rowed variety of barley has been surpassed by the Mandscheuri, in a period of thirty-three years, by an average yield per acre per annum of 10 bushels and by the O.A.C. No. 21, in a period of seventeen years, by 11 bushels. The last named variety is a six-rowed, bearded barley with stiff straw and white grain of good quality. For some years past there has been scarcely a field of any other variety grown in Ontario.

Oats

The total increase of over one hundred and forty-five million bushels of oats in Ontario, resulting from increases in acre yields for the twenty-one years ending with 1922, as compared with the years from 1882 to 1902, was apparently due, to a considerable extent, to varieties introduced by the College. The Vick's American Banner oats were imported by the College in 1891 from James Vick's Sons, Rochester, New York. This name was later abbreviated to American Banner and still later to Banner. In the College tests, the Banner oats were surpassed by the Siberian, imported from Russia, by an average of 3·9 bushels per acre per annum from 1891 to 1902 and by the O.A.C. No. 72 by an average of 9·7 bushels per acre for the past sixteen years.

The O.A.C. No. 72 was started at Guelph from a single seed in 1903. It has a spreading head and white grain of good quality and, in comparison with the Banner, has about two per cent less hull, and requires exactly the same number of days to reach maturity. In the last seven years, of the 990 first prizes awarded to fields of standing oats in connection with the Field Crop Competitions throughout Ontario, the O.A.C. No. 72 received 521; the Banner, 220; and all other varieties combined, 249. In the competitions of threshed grain at four of the leading exhibitions of Ontario, the O.A.C. No. 72 received seventy-two and the Banner forty-one prizes in the last four years, the former surpassing the latter in awards from fifty to one hundred per cent at each of these exhibitions.

Winter Wheat

The Dawson's Golden Chaff variety of winter wheat was distributed from the College to Ontario farmers for the first time in 1893. It increased rapidly and for a long time has been the most extensively grown winter wheat in the Province. The O.A.C. No. 104 was originated at the College by crossing the Dawson's Golden Chaff and the Bulgarian. It is a heavy yielding white wheat with beardless head and white chaff. It was distributed throughout Ontario for the first time in 1916 and is now increasing rapidly in the majority of the counties of the Province.

Sources of Seed

The distribution of seed of these varieties from the College has necessarily been confined almost entirely to the farmers of Ontario. At present, however, they are all being grown by members of the Canadian Seed Growers' Association with headquarters at Ottawa.

PART III

Agricultural Education and Related Activities

AGRICULTURAL EDUCATION IN ONTARIO

By J. B. DANDENO, Inspector of Elementary Agricultural Classes

IT is intended to present here an outline of the history of agricultural education in Ontario, covering especially those activities which are carried on under the Department of Education. These activities are concerned only with schools below College grade and may then be divided into two classes,—(1) Public and Separate Schools; and (2) High Schools. Other features of agricultural education are under the supervision and care of the Department of Agriculture and include the work of the Agricultural College, the Kemptville Agricultural School and the School Fairs. The School Fairs concern only the Public and Separate Schools.

Agricultural education goes back farther than is usually supposed. On the establishment of the first Normal School in Ontario at Toronto, in 1847, provision was made for instruction in agriculture on the regular daily programme. The actual work which was covered in this agricultural course in the Normal School had to do mainly with agricultural chemistry. The body of the work undertaken can be inferred from the papers given at the close of the session in April, 1849. It is of sufficient interest, I think, to warrant my giving a copy of those examination papers. Two prizes, one of five pounds and one of three pounds, were given to those securing the highest and the second highest marks, respectively. In addition to these papers an oral examination was given to ascertain the relative knowledge of the candidates on practical agriculture.

In order to show the scope of the course given in the Normal School seventy-five years ago, a copy of the final examination paper is here given. It is quite certain, however, that little or no practical work was done in preparation for the examination. As the work carried on now in the High Schools of Ontario is intended to be educational rather than informational, the standard, as indicated by a written examination such as this, is apparently on a different plane. In fact the fundamental difference between the viewpoint of those having to do with the work as carried on then, and that of the present time is shown by the questions here given. A person might cram up by book work for such an examination, but, at the present time the important thing is that the student has done the work.

NORMAL SCHOOL FOR UPPER CANADA, TORONTO

EXAMINATION PAPER

For His Excellency the Governor General's Prizes in Agricultural Chemistry, Vegetable and Animal Physiology, and the Chemistry of Food.—(Value of the first prize, £5; of the second prize, £3, in books.) —April 7th and 9th, 1849.

PART 1ST—APRIL 7TH

1. What is the object of the study of Agricultural Chemistry?
2. Name the forces whose effects it is the province of Chemistry to investigate? Describe their mode of action, and state the distinction existing between Chemical forces and other forces influencing matter?
3. Into how may departments is the Science of Chemistry divided, and of what do they respectively treat?

4. Name the so-called organic elements? Associate with each its symbol, combining number, specific gravity, and remarkable properties? also state the names of some compound substances of which one or more of these elements form important constituents?

5. Name the so-called inorganic elements which usually enter into the composition of vegetables and animals.

6. What is meant by the term "adhesion," or "heterogeneous attraction?" Into how many orders is adhesion divided? Illustrate its several orders by examples.

7. What is an acid? a salt? an alkali? Give examples of each class, and affix to each sample its symbol.

8. What is Carbonic Acid? Give its symbol. How many pounds of Carbon are there in two hundred and twenty pounds of Carbonic Acid? How would you exhibit the presence of Carbonic Acid in air? in limestone?

9. How would you exhibit the presence of Carbon in plants? of Nitrogen in the atmosphere?

10. Exhibit the exact composition of Atmospheric Air. State its pressure on the square inch. What products are formed by the passage of lightning through the atmosphere? Give their symbols. In what ratio does the Atmosphere decrease in density as you rise above the level of the sea?

11. What is the composition of Water? What are its most important properties?

12. What is Oxidation? What is Combustion?

13. Name the inorganic acids and oxides, salts and alkalies, commonly found in vegetables, and give their symbols.

14. What is the nature of caloric? How does it affect bodies? In how many states may it exist? What measure of caloric is required to convert water into steam? Upon what circumstance does the boiling point of water depend?

15. How would you illustrate, by examples, the conversion of latent into sensible heat, and the contrary? Explain the phenomena of freezing mixtures. State the effect which an evaporating substance will produce upon surrounding bodies.

16. What is the cause of the development of heat during the decomposition of **vegetable or animal matter?**

17. Explain the phenomenon of dew. What is the dew point? state the conditions required for the formation of dew. How would you exhibit the deposition of dew? Why does dew fall sooner on some bodies than on others?

18. What is Silica? What purpose does it mainly serve in the economy of vegetables and animals? What conditions are necessary in order that water may dissolve it?

19. In what form does phosphorus exist in vegetables? What do you mean by phosphates? Name the phosphates usually found in animals and vegetables. In what state does phosphorous exist in the inorganic world?

20. What remarkable property is common to potassium and sodium?

21. State into how many parts a vegetable may be divided, with respect to its structure, and name them.

22. Trace the course of the sap; mention the changes which are supposed to take place when it arrives at certain parts of the plant.

23. What are the functions of the roots? Of the leaves? How do the trunks of dicotyledonous vegetables increase in dimensions?

24. State the source from which plants derive their organic elements; and give the symbol of each compound you may mention.

25. State the distinction between proximate and ultimate principles, and name the proximate principles found in any considerable quantity of vegetables.

26. What are insomeric compounds? Give some examples which occur in Vegetable Chemistry.

27. Name those proximate principles which are common to plants and animals.

28. Illustrate the composition by means of symbols; first, of grape sugar; second, of cane sugar; third, of gum; fourth, of starch.

29. Into what proximate principles may grape sugar be resolved when it suffers decomposition?

30. Explain the transformation, by means of symbols, which takes place when grape sugar is in part converted into alcohol, and then into vinegar.

31. From what sources are the inorganic elements of soils originally derived?

32. What elements are essentially necessary in the composition of a fertile soil?

33. In what state must all inorganic elements be, before they can enter into the composition of vegetables?

Part 2nd—April 9th

34. What is the object of ploughing the soil? Explain the difference between surface ploughing and subsoil ploughing?

35. What is the object of draining? State the various effects which careful ploughing, subsoil ploughing and thorough draining may be supposed to produce upon the condition of the soil.

36. Name the depth, breadth, and width of the drain generally constructed for the purpose of thorough draining; draw a sectional diagram of two or three different kinds of drains. How far apart would you place your drains; first, in heavy land; second, in light land; and how would you place them in draining a hillside?

37. Name the inorganic elements which enter largely into the composition of the cerealia.

38. State the composition of common granite rocks, and name all the substances which a decomposed granite rock may be supposed to give in the soil.

39. How may decomposition of the mineral substances in a soil be accelerated? What is clay, and how would you accelerate the decomposition of clay silicates? What object would be secured by such decomposition?

40. State the various reasons which induce the application of manures to the soil.

41. Illustrate, by examples, the various modes in which, first, vegetable; second, animal; third, mineral manures may fertilize the soil.

42. Why is farmyard manure a good fertilizer? What is the character of the fluid portion of farmyard manure?

43. State the nature of the change which takes place upon the decomposition of urea. Why is the resulting compound beneficial to vegetables? Give its symbol. What peculiar property does it possess, and how would you render it serviceable?

44. How would you accelerate the decomposition of organic matter in the soil? What purpose is served by the decomposition of organic matter?

45. Name the compounds which are the ultimate results of the decomposition of organic matter.

46. Explain the principles upon which the benefits arising from a proper rotation of crops are dependent.

47. What inorganic compound does milk contain in abundance? State the source of that compound, and the purposes it serves in the animal economy. With what substance would you manure your pastures in order to increase its quantity in the milk?

48. What is the composition of gypsum? of common salt? of lime? and for what purposes would you lime: first, heavy clay land, containing but little carbonate of lime; second, peaty soils?

49. State the composition of a marl.

50. What is meant by the fallowing of land? For what purpose do you fallow land?

51. What purposes do the proximate principles found in the vegetables which contain nitrogen serve in the animal economy?

52. What purposes do the non-nitrogenized proximate principles serve and in what form are they chiefly given off by the animals?

53. Give a list of the nitrogenized and chief non-nitrogenized proximate principles found in vegetables.

54. What inorganic substances enter largely into the animal frame?

55. Trace the course of the food from the mouth to the time of its mingling with the blood.

56. Trace the course of the blood from the left auricle of the heart, through the animal frame.

57. State the nature of the change which takes place in the blood when in the lungs. In what other parts of the system does a change take place in the chemical composition in an inorganic portion of the blood? Illustrate that change by means of symbols.

58. What peculiar property does the saliva possess, and what purposes does it serve in the animal economy.

59. Upon what order of adhesion is the effect of alcoholic liquors supposed to be dependent?

60. What is the theory of the transformation which takes place when milk

is brought in contact with an animal membrane, as in the curdling of milk?

61. Explain the reason why meat well boiled in large quantities of water is not nutritious. And how would you prepare the strongest soup from a given quantity of meat? In what way would the mode of preparation differ, if you prepared the meat alone for consumption?

62. Why is salted meat deficient in nutritious qualities?

63. From what source do the young of mammiferous animals derive their bony structure? Express the chief proximate inorganic principles in symbols.

64. Upon what four conditions is the healthful flow of the various aqueous currents in the animal body and in the vegetable dependent?

65. What is the primary cause of "colds," and of that determination to disease which has of late years been exhibited by many vegetables, especially in the tubers of the potato?

66. What remedy, in part, would you suggest with reference to vegetables?

N.B.—An oral Examination to take place after the time for answering the foregoing questions has elapsed, for the purpose of ascertaining the relative knowledge of the candidates on the subject of Practical Agriculture, as well as their aptitude to communicate a knowledge of Agricultural Chemistry, in all its branches.

The Examination was conducted on paper—eight hours in all having been allowed to the competitors to write out their answers to the questions, which. for the first time, were placed before them on their entering the Lecture Room for examination. One of the Examiners presided to see that no competitor received any foreign assistance in the preparation of his or her answers. At the expiration of the time allowed for preparing the answers, they were all collected, and subsequently examined and compared with great care by the Examiners.

So far as can be gleaned from the meager history of Education in Ontario, even though what might be called a strong course was given in the Normal School, little progress was made, and agriculture was not taught in any other school. In 1870, Dr. Ryerson made an earnest effort to revive the teaching of agriculture and actually prepared a text book himself, entitled "First Lessons in Agriculture, for Canadian Farmers and Their Families." This text was authorized by the Council of Public Instruction for Ontario and is now interesting for two things, (1) it gives evidence of the tremendous enthusiasm of the author whose agricultural training consisted only in his experience as a young man on the farm, and (2) it shows the method of teaching employed at that time. The body of the book is made up of question and answer, catechism style, and is intended wholly to give information. It is needless to say that such a method would really kill off any enthusiam in teacher and pupil, and therefore the results, so far as we understand agricultural education to-day, would be anything but hopeful. So far as the records show, classes were carried on only in the Normal School and they were discontinued in about seven or eight years.

In 1889 the regulations amending the Public School Course of Study made agriculture obligatory in Rural Schools in Forms IV and V. In Form V a text book was to be used and immediately after this (1890) a text book was prepared by Mills and Shaw of the Ontario Agricultural College, and authorized by the Department of Education. Although the subject was made obligatory for Rural Schools, there is little or no evidence of its having been taken seriously at all.

About this time "Nature Study" began to develop, soon becoming very popular in the Province, and whatever agriculture may have been introduced because of the fact that it had recently been made obligatory, dropped out and gave place to Nature Study. In 1904 a Nature Study branch was established in connection with the Macdonald Institute, Guelph, and linked up with the On-

tario Agricultural College. This work was carried on until about 1912, and is important because of the fact that, from the work done in this Nature Study branch of the Ontario Agricultural College, the scheme of agricultural education as it is to-day in Ontario had its birth. Professor S. B. McCready was in charge of the work at that time.

Up until 1913, no classes in agriculture had been established in the High Schools, although, according to the regulations, some agricultural topics might be elected by the High School pupils if such election be concurred in by the Principal of the school and the Trustee Board. A text book was prepared by Dr. C. C. James, and authorized in 1898, with the intention that it be used in connection with any classes that might be introduced into either the Public or High Schools.

In 1907 district representatives were appointed to convey to the farmers of the country definite agricultural instruction, and to give instruction in agriculture in the High School located in the place to which the representative was sent. A representative was appointed in 1907 to each of six High Schools—Galt, Morrisburg, Perth, Lindsay, Essex and Collingwood. (It might be stated here that there is now at least one representative in each county). In four or five years these representatives abandoned the teaching of classes in their respective High Schools and devoted the time at their disposal to what might be termed extension work. In 1911 or 1912 School Fairs were organized here and there by these officials in co-operation with the Public School Inspectors, and these Fairs have been growing in number and importance ever since.

It should be pointed out that where district representatives were employed, the Board under an Advisory Council was expected to carry on Departments of Agriculture in High Schools in order to meet the educational needs of those who did not expect to enter either a University or any of the so-called professions. It might fairly be said now that these departments were in no way a success so far as agricultural education in a High School is concerned. Yet, in some respects the move to establish such departments with teachers who were graduates of the Ontario Agricultural College in charge, was the most important move ever made in the direction of establishing regular agricultural classes in High Schools. There is a considerable difference of opinion now as to why this move did not meet with success.

During the years 1909 to 1915, considerable progress was made in bringing the subject before the attention of the people, and the problem was attacked from various angles. Summer courses in agriculture for Public School teachers were established, short courses for Inspectors were given, grants were provided for carrying on classes in agriculture in the Public Schools, and efforts were put forth to induce Boards and teachers to provide school gardens.

In 1912 the Dominion Government made an appropriation of $500,000, under *The Agricultural Aid Act,* to enable the Provinces to carry on the agricultural instruction already begun, and to establish additional activities as might be required. This grant was made pending the passing of *The Agricultural Instruction Act,* (assented to June 6, 1913) and the adoption of a line of policy to be followed out in the expenditure of the money. After the passing of *The Agricultural Instruction Act* a policy was outlined and Dr. C. C. James appointed Commissioner. The Act appropriated $10,000,000 to be available during the ten years ending March 31, 1923, and was divided

among the different provinces on the basis of population. The money was to be used for *education, instruction* and *demonstration,* and the provinces as represented by the Departments of Agriculture and of Education were to be free to draw up plans for the expenditure of the grants. These two Departments of the Provincial Government were intended to have equal share in the responsibility for the uses to which the money was to be applied.

The financial support thus secured enabled those in charge of agricultural education in Ontario to plan a broader basis and to build more permanently thereon. The financial requirements of the situation seemed to be secure for the next ten years (Details concerning the terms of *The Agricultural Instruction Act* can be obtained from the report of the Commissioner from year to year). As is the case with all phases of education, the paramount factor is the teacher. Sufficient evidence was at hand to demonstrate clearly that, unless teachers could be secured who had some training in agriculture, no permanent progress could be expected. Following up this idea summer courses in agriculture were provided for teachers at the Ontario Agricultural College.

A summer course in Nature Study for Public School teachers was established in 1909, at the Macdonald Institute, Guelph, with an attendance of about fifty, and at the same time a class of six teachers received instruction in topics somewhat similar to those given to the class in Nature Study, but under the heading "Elementary Agriculture." This was the beginning of the courses now carried on at the Ontario Agricultural College, at Whitby, Kemptville and Monteith in summer sessions. (For details of these see reports of the Minister of Education of 1916 and following).

In 1913, courses were provided at the Ontario Agricultural College for High School teachers and Normal School teachers. This course led to an intermediate certificate in agriculture and qualified the teacher to teach agriculture in a Public or High School. The work pertaining to this course is given only at the Ontario Agricultural College, and has been carried on now for ten years. (See report of the Minister of Education for 1916 and following).

All the teachers of agriculture in the Normal Schools are now holders of intermediate agricultural certificates and have been giving instruction in this subject for eight years.

With respect to financial assistance rendered by the Provincial Government in aid of this work, it should be stated that grants were made as early as 1907. The following, taken from the report of the Minister of Education of 1907, page 175, shows that a beginning had been made. "In 1906, $2,000 was voted for Elementary Agriculture and Horticulture, but only $124.50 of this sum was spent". In 1921, however, 15 years later, $109.900 was paid out in the form of grants in support of the work as now carried on. Of this amount, $40,000 came from the federal appropriation. At the present time, financial assistance is given to both Boards and teachers—to the former as a refund of expenses for equipment for teaching agriculture, and to the latter as an encouragement to take the courses provided and to carry on the work. (For details see circular No. 13 of the Department of Education and the Minister's Report from year to year).

To summarize the results, so far as attendance at the summer courses is concerned, a table is here given:

ATTENDANCE AT THE ONTARIO AGRICULTURAL COLLEGE SUMMER COURSES IN AGRICULTURE

Year	Elementary				Intermediate					Inspectors	Farm Mechanics	Total
	I		II		I		II		III	I II		
	Men	Women	Men	Women	Men	Women	Men	Women	Men	—	—	Total
1911	8	75	1	16	...	...	...	...	...	...	...	100
1912	16	65	2	23	...	...	...	...	...	...	...	106
1913	14	64	5	36	23	4	...	...	...	...	...	146
1914	8	55	5	27	13	4	14	...	...	...	...	126
1915	15	39	5	18	17	1	9	1	...	...	...	105
1916	11	99	9	31	15	3	14	1	...	...	...	183
1917	15	138	7	81	9	1	13	2	...	...	10	276
1918	6	187	7	119	20	11	9	...	9	79	9	456
1919	16	155	6	160	9	19	7	21	...	86	10	489
1920	28	125	10	135	7	25	19	...	...	8	10	374
1921	62	167	36	86	24	15	16	8	7	...	7	428
1922	54	175	27	151	15	12	18	15	...	4	...	471

ATTENDANCE AT THE WHITBY LADIES' COLLEGE SUMMER COURSES IN AGRICULTURE

Year	Part I Elementary	Part II Elementary	Total
1919	70	...	70
1920	69	46	115
1921	80	50	130
1922	40	78	118

ATTENDANCE AT THE NORTHERN ACADEMY, MONTEITH, SUMMER COURSES IN AGRICULTURE

Year	Part I Elementary	Part II Elementary	Total
1920	23	...	23
1921	17	8	25
1922	15	18	33

ATTENDANCE AT KEMPTVILLE AGRICULTURAL SCHOOL, SUMMER COURSE IN AGRICLUTURE

Year	Part I Elementary	Part II Elementary	Total
1922	64	...	64

In order to show how much progress was made from year to year the following summary is given:—

NUMBER OF PUBLIC AND SEPARATE SCHOOLS QUALIFYING FOR GRANTS, 1903-1922

Year	Number of schools	With school gardens	With home gardens
1903	4	...	...
1904	7	...	...
1905	6	...	...
1906	8	...	...
1907	2	...	...
1908	14	...	...
1909	16	...	...
1910	17	...	...
1911	33	...	...
1912	101	...	...
1913	159	...	...
1914	264	208	56
1915	407	222	185
1916	585	554	261
1917	989	466	523
1918	1,020	588	432
1919	1,408	618	790
1920	1,648	702	946
1921	1,804	690	1,114
1922	2,047	796	1,251

The following table gives the number of High Schools qualifying for grants since 1915:

	Number schools	With plots	Number plots
1915			
Jan.-June	11		11
Sept.-Dec	15	.	15
1916			
Jan.-June	15	1	14
Sept.-Dec	20	1	19
1917			
Jan.-June	20	7	13
Sept.-Dec	21	7	14
1918			
Jan. June	21	16	5
Sept.-Dec	26	18	8
1919			
Jan.-June	23	16	7
Sept.-Dec	30	23	7
1920			
Jan.-June	32	29	3
Sept.-Dec	25	24	1
1921			
Jan -June	21	17	4
Sept.-Dec	28	17	11
1922			
Jan.-June	29	27	2
Sept -Dec	30	27	3

Results Accomplished

By referring to the foregoing table it may readily be seen that nearly one-third of the Public and Separate Schools of the Province are now giving instruction in elementary agriculture, and about two-fifths of these schools are maintaining school gardens.

At first it was intended that such work as is now carried on in the classes in elementary agriculture would be applicable to rural schools, and financial assistance was given to these schools only. In the course of a few years (about 1917) it was shown that agriculture was not only applicable to such schools, but was actually carried on with more enthusiasm and apparent success than in the small rural schools. Agricultural grants were then extended to include all types of public and separate schools.

The chief beneficial results so far may be summarized as follows; (1) Improvement in school grounds, indirectly through the use of the school garden and flower beds; and in many cases, lawns are neatly kept. (2) More interest is taken in the work of the school by parents and pupils alike.

(3) Better attendance is secured up to the closing of school in June and also at the opening of school in September. This is brought about because of the fact that the best of the time in the school year for garden work is at the close of, and, at the opening of, school. (4) Additional interest is taken in the activities of the farm arising out of the problems taken up in school. In addition to the above, it should be pointed out that garden work provides material for arithmetic, language and geography. Moreover, a good garden is a work of art.

The High Schools in some respects are the most important factor in elementary agricultural education because of the fact that the pupils of such schools are at an age when lasting impressions are made, and because in some respects they are the training ground for teachers. From the records shown above only thirty secondary schools out of a total of about three hundred and seventy, or less than one-twelfth, are giving instruction in agriculture.

Until 1921, the subject was counted only as a bonus and had no recognition as an educational subject at all. Since 1922, however, agriculture may be elected instead of biology in the first and second years of the High School course, and instead of physical science of the third and fourth years. This substitution is accepted for Junior Matriculation and for entrance into the Normal Schools. Those who take the four-year course in agriculture are given an elementary certificate in this subject. Those who do not elect agriculture in the High School course are required to take two summer sessions in order to secure an elementary agricultural certificate.

Financial assistance is given to both the Board and the teacher, but, so far, not much effort seems to have been

made by the High or Continuation Schools to undertake the teaching of agriculture, as now provided for. (Refer to the High School Course of Study, 1922, page 35, and to the Regulations of 1922, page 23).

In Ontario there are seven Normal Schools with an attendance of about 1,700 pupils. Regular instruction in agriculture (with the aid of a good school garden) is given in each of these schools, by a teacher especially qualified. Under this arrangement each teacher-in-training receives instruction in agriculture, not only in methods but also in elementary agriculture itself. More advanced work could be carried on than is now the case, if the High Schools generally undertook the work now provided for as an option.

The Summer Courses in agriculture are given with a view towards fitting, as far as possible, those who are to teach agriculture in the Public and Separate Schools, and in the High Schools. A two-session course is given for those who intend to teach in the Public (primary) Schools, and a more advanced two-session course is given to those who are to teach in High (secondary) Schools. The former leads to an Elementary certificate in agriculture and the latter to an Intermediate certificate. Any teacher may enter the course leading to an elementary certificate, but only those qualified to teach in a High School may be admitted to the course leading to an Intermediate certificate.

Those who hold Intermediate certificates and who are Specialists in Science may take a third summer session and qualify for a Specialist's certificate in agriculture.

A summer course in Farm Mechanics is offered to any one holding an Intermediate certificate in agriculture.

A specialists's certificate in both Agriculture and Science may also be obtained on either of the following qualifications:

(1) A First-Class Grade A or a High School Assistant's certificate granted on the Science option under the amended Regulations of 1917, with the degree of B.S.A., after the prescribed course at the Ontario Agricultural College.

(2) A Faculty Entrance certificate granted on the Science option with the degree of B.S.A., after the prescribed course at the Ontario Agricultural College, and with the professional certificate obtained after the prescribed course for Science and Agricultural Specialists at the College of Education.

The chief difficulties in the way of a more general acceptance of Agriculture as a regular subject on any school course are about as follows: (1) The people have an inherited objection to the classing of Agriculture as an educational subject. It is looked upon as work, not as education. (2) As a general rule, farmers themselves are opposed to it because they see people in the city—professional, commercial and industrial—are able to gain a much greater competency with less expenditure of time and energy. Therefore they want their children to leave the farm. (3) Higher institutions of learning have until recently refused to recognize a course in Agriculture as education at all. Hence, where a student looked forward to a university course he naturally avoided Agriculture, even if offered to him, and took those subjects which were recognized for entrance into the institution.

Although many people are theoretically in favour of some kind of vocational agriculture, yet, when plans are laid for it, very few boys can be found who are willing to attend, because the work offered in such vocational school leads only to the farm. Excepting the few who may be rich enough to start in agricultural pursuits for themselves, the outlook is none other than that of a hired man, and this is not attractive. Almost

no vocational agriculture has been established in Ontario so far. A few Secondary Schools have organized and commenced what have been called Departments of Agriculture with some promise of success in a few districts in which more or less specialized agriculture is carried on. It is hoped, however, that through evening classes and short courses, some vocational agriculture may be permanently established in the future.*

* See Regulations Respecting Department of Agriculture and Household Science, 1915.

SCHOOL EXHIBITIONS, NOVA SCOTIA

By L. A. DEWOLFE, B.A., M.Sc., Director of Rural Science Schools

SCHOOL Exhibitions attract considerable attention each year during the months of September and October. In some lines the standard is maintained, and in others, improved. An improvement in organization is particularly noticeable.

One defect which is difficult to remedy is the lack of a standard in judging vegetables when local judges are employed. For instance we saw very large, deformed potatoes given first prize at a local exhibition by a local judge; and when the same potatoes were sent the next day to the county exhibition, the professional judge gave them no consideration. The boy who exhibited them cannot understand why judges should disagree. It seems necessary to train one or two judges in each locality.

Children should not expect prizes on defective or diseased material; neither can they expect attention to exhibits that do not conform to the prize list. Collections of insects or plants unnamed are not valuable. Such exhibits should be accompanied by explanatory notes in order to make them educational. Bouquets are almost invariably bad. Too many flowers are crowded into a vase, so that it simply becomes a bunch rather than a bouquet.

Several exhibitions include reading contests, spelling matches, etc. These are good when properly conducted but too often the "reading" is mere sing-song and the "spellings" are not well chosen for the grades in the contest. Health songs and health posters are becoming common. School parades are effective in attracting public attention.

At some county exhibitions the children's department is a big feature. At others, it is a side show, or does not exist at all. The importance placed on it depends partly upon the vision of the secretary-treasurer, partly upon the local teachers, and partly upon available prize funds. In provinces where the prize money is drawn from government sources and where organizers and assistants can afford to set up and judge the exhibits, the success is greater than with us where we must depend upon local support. A grant sufficiently large to enable us to send representatives to each county exhibition and to contribute to the prize list would produce very beneficial results.

We admit that training children to work only for money prizes is bad; but while grown-ups urge that phase of it, children cannot well be taught otherwise. Parents encourage exhibitions not for their educative value but for the money the children may possibly win. To make sure of a prize, the parents too often do all the work, and merely use the children's names. They will sign a certificate that the exhibits are the product of the children's work. We need not fear, therefore, that the generation of "grafters" and "parasites" will soon die out.

SCHOOL FAIRS AND SCHOOL AGRICULTURE NEW BRUNSWICK, 1923

By A. C. GORHAM, Director of Elementary Agricultural Education

MANY school fairs were held last fall although the season in New Brunswick was cold and dry, and to some it looked as though there would not be sufficient from the plots and gardens to make a worth while exhibition. However, some thirty-one fairs were held in which eighty schools took part, and in most cases, although some classes of vegetables were not as well matured as in other seasons, the exhibits were excellent.

The United School Fair

The organization of the United School Fair in which two or more districts take part has been encouraged because it makes it possible for the officers of this Department to examine the work of a larger number of schools than if separate fairs were held. They are, however, with our present method of carrying on, rather more difficult to organize than the one district fair. Our plan has been to select a section where two or more schools may conveniently unite to hold a fair. If there are a number of schools exhibiting, the most central district, or the one having the best facilities, is chosen. This plan is submitted to the teachers and trustees of the different districts, and they are asked to communicate with one another with a view to making arrangements for the fair.

The uncertainty attending this method of organizing by correspondence is overcome where the organizing is done by the Agricultural Representative, as he is in a position to give practical assistance with the plans. Thus far, our district representatives have been unable to conveniently cope with the situation, although some assistance has been given in some sections.

In this connection a very important suggestion was made at one or two of the fall fairs. It was proposed that a committee be appointed composed of representatives from the board of trustees, teachers, Women's Institute or other organizations, so that the arrangements for the school fair may be dealt with at the proper time and that it may be made a permanent event and not neglected through the frequent changing of teachers. Special meetings will be held to carry out these suggestions.

As to the comparative educational possibilities of the United School Fair as compared with the one district fair, the larger fairs are important especially from the standpoint of organization and to broaden the horizon of the girls and boys through the inter-scholastic competition. Yet the one-room school fair should not be despised because, through it, much more may be accomplished educationally as there is better opportunity of pointing out to the pupils and parents the objects of the work.

The School Fair and County Fair

Some of the school fairs were held in conjunction with the County Fair, and while sufficient space was allotted for the exhibits and they were brought to the notice of a large number of people, yet, as a general thing, the fair held under such conditions is not as productive of good results as when held separately.

The Prize List

A prize list is published by this Department and sent to each district for the guidance of the pupils in preparing exhibits. There is a long list of sections in each of the following classes: Vegetables, Nature Study

work such as collection of wood specimens, leaves, ferns, weeds, drawings, essays, statements of profit and loss in connection with home plots and poultry projects; also Poultry and Manual Training exhibits and Domestic Science articles —sewing, canning, preserving, cooking, etc. These are to be prepared under the supervision of some competent person, as the Domestic Science teacher or under the guidance of the members of the Women's Institute.

Prizes

The prizes are usually given in the form of money. Forty per cent of the total amount of the prize money is contributed by the Department of Agriculture, the remainder, 60 per cent, is furnished on the day of the fair by the district. This may either be granted by the trustees or, as is often the case, the money is obtained through the sale of produce from the gardens or from the sale of other articles on fair day.

Much interest has been shown in the school fair by public spirited persons and local societies. Members of the Women's Institute and the Daughters of the Empire have contributed much in time and special prizes to encourage the youthful exhibitors to take part and reap the full benefit of this form of practical education.

A certain bank and a large business concern have very generously donated respectively prizes in the form of a silver cup and boxes of fancy wares.

Directions for Organizing

A pamphlet has been prepared by the Director of this work to aid teachers and trustees in organizing a fair.

Practical suggestions are made as to method of organizing and management, securing judges, appointing of committees, and working out a programme for the public meeting on fair day.

Judging

The work of judging at each fair is supervised by the Director or some official from this Department. A pamphlet has been prepared which will serve as a guide to the judges. Local judges are secured, usually two for each class of exhibits. The larger number of judges helps to distribute the work and gives better satisfaction generally. Judgments are less liable to adverse criticism when two or more judges are working together.

The pamphlet explains what judging involves; the educational value of competition; gives a score card and standards for judging vegetables and poultry.

The School Fair and School Work

All exhibits must be the result of systematic work throughout the year to be of the greatest value, and it is a noticeable fact that the most successful fairs are those which are carefully planned months in advance. Conversely, it will be seen that one of the objects of the fair is to make it act as an aid and a stimulus to the teaching of Nature Study and Agriculture in the school; to help teachers to use the nature study method, which is the observational and investigational method. It makes use of the child's great curiosity regarding the things of nature in his environment The pupil will be encouraged to carry out small but worthwhile, purposeful projects for the fair. This not only interests the pupils but the parents as well. This interest is the first requisite of good teaching.

Through the fair and its various exercises much may be done in the way of correlating subjects. For example, it has been noted by teachers and pupils at united school fairs that districts of close proximity produce very

different results in the vegetable crops. This was very noticeable during the past season.

The writer believes that these differences are due not alone to the superior knowledge of the youthful gardeners of one district as compared with those of other districts, but also to slight differences in soil and climatic conditions. Such factors being taken into consideration as altitude, exposure, humidity, early and late frosts, proximity to large bodies of water, currents of air from off the land or ocean, etc.

The effects of such varying conditions are brought to the notice of teachers and pupils so they may study them more closely and use the information in the correlating of certain subjects as Geography, Nature Study and Agriculture.

When spring comes and the poultry projects are taken up and the home plots and gardens are sown, the pupils may be taught to keep records and to find the cost of production. In fact the carrying out of these exercises is stipulated in the agreement made between this Department and each pupil at the time of taking up the project work. The teacher and parents also sign the agreement.

A real practical lesson in civics may be taught in organizing and managing the fair. The writer was greatly pleased this year when he found that at many of the fairs committees had been appointed from among the pupils, and that they had carried out their work faithfully and effectively.

The moral side of the question is not to be overlooked. The children are learing now to co-operate—how to live together—which is really one of the great lessons that the world is finding hard to learn. In all this competition between districts and between pupils, they may be taught to take failure without resentment and success with modesty, always emphasizing the spirit of fair play.

ONTARIO THREE-MONTH SCHOOLS

By L. STEVENSON, B.S.A., Supervising Director

THE three-month schools in elementary agriculture and domestic science for the rural young people of Ontario have this winter been increased to twelve. In 1921-22, when they were just organized, four such courses were held, and in the winter of 1922-23, on account of popular demand, the number was increased to eight. The courses are conducted by the Agricultural Representative, assisted by resident teachers and visiting specialists. They are being held this year at the following places:

Barrie (Simcoe, North and South); Lindsay (Victoria); Keene (Peterboro); Kingston (Frontenac); Brinston (Dundas); Renfrew (Renfrew); Essex (Essex); Belmont (Middlesex and Elgin); Exeter (Huron); Ancaster (Wentworth); Fergus (Wellington), and Caledon (Peel).

Instruction is given for boys in animal, field and poultry husbandry, farm dairying, veterinary science, horticulture and vegetable growing, soils, fertilizers, farm mechanics, drainage, beekeeping, botany, economics, and public speaking, and in household science, nursing, sewing and millinery for girls. The schools are held during December, January and February, and their object is to give practical instruction to those who have been unable to take up this work in regular institutions.

JUNIOR JUDGING COMPETITIONS

By J. A. CARROLL, Agricultural Representative, Peel County, Ontario

THE Junior Farmers' Association, Peel county, Ontario, held its fourth annual stock-judging competition in October last, thirty young men from different parts of the county competing. Substantial prizes were awarded on the following classes of stock, judged on the farms of local breeders: Dairy Cattle, Beef Cattle, Sheep, Swine, Horses. The two boys with the highest aggregate scores were given a trip to the International Fat Stock Show and Boys' and Girls' Congress held in Chicago in December.

A Home Economics Judging Competition for girls was held concurrently with the boys' competition, and will probably be made an annual event. In previous years, teams of three girls representing different branches of the Junior Institute participated in similar contests held at county and township fairs, but this year the contest became an individual competition with prizes for the following classes: Cake and School Lunch; Apron and Pillow Covers; Centre-pieces and Towels; Butter; Good Dressing; Bread and Tea Biscuits.

Forty-eight contestants judged the exhibits, which were supplied by the senior Women's Institute and interested persons. The Brampton Girls' Club supplied the models for the Good Dressing class. The contestants were required to give the reasons for the placings. The two girls ranking highest in the aggregate were also given a trip to Chicago.

At the conclusion of the competitions a union supper was held, arranged by the joint executive and participated in by both Junior Women's Institute and Junior Farmers' Institute competitors.

IMPROVEMENT OF SCHOOL GROUNDS

"DURING the summer of 1915," states Mr. F. W. Bates, Director of School Agriculture for Saskatchewan, " a fine two-roomed school was erected in the village of Creelman. This school was placed in a ten acre plot which had been secured three years previously. The school board at once set out to make the grounds a real beauty spot, and was one of the first to take advantage of the plan whereby the Department of Education arranged for the free distribution of trees, shrubs and perennials for school planting. In consultation with the School Agricultural Branch, a planting plan was prepared for the grounds and in the spring of 1916 both trees and perennials were planted and the plantations did well.

" In 1921, the services of a man who took great pride in improving the grounds were secured. At the request of the School Board, a further supply of shrubs and perennials was sent. Since that further progress has marked the passage of the years, until, among others who have remarked on the appearance of the grounds, Hon. C. A. Dunning was particularly pleased on a recent visit which he paid at Creelman."

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

CANADIAN LIVE STOCK INDUSTRIES

The Marketing of Meat Producing Animals and their Manufacture under the Stock Yards and Abattoir System

By E B. ROBERTS, Editor, The Industrial and Development Council of Canadian Meat Packers

System of Live Stock Marketing

CENTRALIZED marketing and large-scale meat manufacturing are the distinguishing characteristics of the Canadian live stock industry. The early stages by which the system developed were briefly as follows:

1. A rapid opening up within one generation of wide stretches of hitherto undeveloped lands in the Far West, lying between Lake Superior and the foot hills of the Rocky Mountains, and their use first as ranges and later for farms of smaller unit;
2. The equally rapid growth of meat consuming population, centred in the Eastern Provinces of Ontario and Quebec;
3. The necessity for all exports of natural products like meat having to run due East for a distance of between one and two thousand miles to the Atlantic seaboard.

Incidentally, these conditions sketch also the lines of national expansion for the last forty years in Canada. Nothing like the English, Scotch, or Irish weekly markets, to which cattle may be driven on the hoof, was ever possible except in a few places. Even before the opening up of the Western Provinces, which gave the live stock industry its present day distinctive characteristics, conditions in the older provinces made such small markets difficult or impracticable. The distance between Montreal and Toronto, for example, is as great as that between London and Edinburgh. The contrast in physical conditions may be grasped when it is understood that cattle to-day are transported by rail from north of Edmonton in Alberta to be slaughtered in Toronto, a distance of almost two thousand miles.

Special methods of transportation had to be evolved or old methods adapted. Cattle, it was found had to be sent by carload and by trainload to large slaughtering centres. Hence the trade from the first had to be one of comparatively large units. The first step in marketing would be taken where a group of farmers would combine to send their stock to market by making up carload lots, for broken lots are generally less profitable. More and more, to-day, in the better feeding districts, the drover or cattle dealer, buying direct from the producer, gathers his cattle in carload lots, sometimes sorts them like with like, and forwards them to market. In almost every case these large markets, known in the Dominion as public

Bird's eye view from an airplane of the Toronto Stockyards, the largest in Canada. In 1922 363 162 cattle, 86 396 calves, 343 385 swine and 231 603 sheep and lambs were sold on these stockyards. They cover thirteen acres of land. Adjacent, marked by figures, are three of the large meat packing houses. Their combined cold storage capacity is 17 000 beef carcases.

stockyards, are at large centres of population, near the meat factories or packinghouses.

Naturally, long distance railway transport presented its own problems, and these had to be solved before the trade could flourish. At convenient places, such as between Winnipeg and Toronto, a distance of over eight hundred miles, there are three or four well equipped feeding stations where the cattle or other live stock must be detrained for a short time to allow them feed, water and exercise. The time limit over which animals may be confined in cars without such a break is thirty-six hours.

Stock Yards

When the live stock thus "shipped" —a general term used throughout North America for despatching, a survival of the early Colonial term when transport was by water— reaches its destination in the Eastern or Western provinces, it is unloaded directly into the public stockyards. These are situated at Toronto, Ont., Montreal, Que., Winnipeg, Man., Calgary, Alta., Edmonton, Alta., Moose Jaw, Sask., and Prince Albert, Sask. All those in use are modern in plan, and well equipped with open and covered pens for cattle, sheep and swine. The pens are generally arranged on a chess board system with alleyways twelve to twenty feet wide running between. The holding capacity of Canadian stockyards is from a thousand five hundred to ten thousand cattle at a time; one thousand to six thousand sheep or lambs; and from one thousand to eight thousand hogs.

The ownership of stockyards differs in different places: some belong to the respective Provincial Government, others to specially registered companies, and one or two are owned by leading railway companies. But their buildings and operation in all instances are under the inspection and supervision of the Dominion Minister of Agriculture. They must be adequately fitted to receive, hold and generally care for all animals in a manner approved by the Minister, according to the provisions of *The Live stock and Live stock Products Act.*

Meat-yielding animals, by car lot or mixed car lot, are usually consigned to commission men, or selling agents, who act for the farmer or drover. As the name implies, they work upon a commission basis, which is generally a percentage of sales. All acting commission men are members of the recognized local Livestock Exchanges, under whose rules they work.

The principle buyers on the public stockyards are employees of the various packing houses, though there are also many so-called "small packers", local butchers, exporters, etc., whose competition on any stockyard in the aggregate is highly important. A strictly competitive system of buying obtains, and prompt cash payment is the rule.

Buyers go around the pens, and after inspecting the stock, make bids to the commission men. All live stock is sold by weight: so much per pound is bid. The weighing is done independently on public scales and is part of the services rendered by the stockyard company. Every "ticket" or record of sale is made out in triplicate and is open to examination by any one. This system, after long experience, appears to satisfy all parties. The only factor of importance that alters from day to day is the price bid, which naturally depends on the market demand, quality and condition.

A small part of the live stock handled through the central markets is bought again by commission men,

acting on behalf of farmers who wish to feed for future marketing. This buying for " country shipment ", taking the place of the old-time monthly fair, is one of the ways in which farm stock is renewed in Canada. Livestock purchased for the United States, either as stockers and feeders or for immediate slaughter, is dealt with in the same way.

The foregoing is, in outline, the Canadian method of cattle marketing. It provides the live stock raising farmer at the most distant part of the country with a complete chain of service. He does not see his cattle after they have left the farm, and has nothing more to do from that moment until he receives a cheque for the amount of the sale from the commission firm, it may be two thousand miles away.

The statistical tables below supply the most recent information available as to the number of cattle sold, the capacity of the stockyards, etc.

Capacity of Stockyards

—	Cattle	Calves	Sheep	Swine
Toronto (Union)..	8,000	... ...	6,000	7,500
Montreal (E. End, C.P.R.) ...	3,000	1,000	5,000	2,000
Montreal (Pt. St. Charles)........	3,200	... ...	....	......
Winnipeg (St. Boniface).....	10,000	......	4,000	6,000
Calgary.	5,000	....	2,000	2,000
Edmonton........	2,500	. .	1,000	1,000

Marketings at Stockyards, 1921 & 1922

The cattle and calves marketed at the eight chief stockyards of the Dominion during 1921 and 1922, as reported by the Markets Intelligence Service of the Dominion Department of Agriculture, were as follows:

—	Cattle		Calves	
	1922	1921	1922	1921
Toronto...	303,882	320,229	84,263	66,937
Montreal W ...	33,078	36,399	53,040	56,164
Montreal East.. ..	34,021	38,972	57,336	46,725
Winnipeg........	294,052	158,282	34,151	21,442
Calgary.	89,429	79,896	16,307	13,213
Edmonton..... .	88,447	39,706	12,827	5,287
Total	842,909	673,484	257,924	209,768

Where Canadian Live Cattle Go

The following table shows the number, value and destination of Canadian cattle exported in five year periods from 1890 to 1910 and every year thereafter:

Fiscal Years	Great Britain	United States	Other Countries	Total	Total value
	No.	No.	No.	No.	$
1890..................................	66,965	7,840	6,649	81,545	6,949,417
1895..................................	85,863	882	7,057	93,802	7,120,823
1900..................................	115,056	86,989	3,479	205,524	9,080,776
1905..................................	159,078	3,696	4,328	167,102	11,360,969
1910..................................	140,424	12,210	4,752	157,386	10,792,156
1911..................................	113,795	7,576	3,552	124,923	8,537,473
1912..................................	47,868	9,807	3,842	61,517	4,098,179
1913..................................	12,069	28,268	3,959	44,296	2,237,135
1914..................................	9,788	206,446	3,615	219,849	7,906,794
1915..................................	....	183,672	2,252	185,924	9,267,534
1916..................................	1,752	227,202	12,581	241,535	12,625,760
1917..................................	....	164,169	1,967	166,136	7,883,842
1918..................................	....	189,229	2,130	191,359	14,136,944
1919..................................	....	308,562	2,934	311,496	30,069,490
1920..................................	479	500,216	14,830	515,525	46,099,553
1921..................................	131	295,297	2,443	297,853	21,099,553
1922..................................	35,418	172,981	5,105	213,504	8,538,051
1923..................................	25,758	228,397	4,280	258,435	9,000,404

Abattoir Methods

Most of the packinghouses or abattoirs have been built on sites close to existing stockyards. As soon, therefore, as the buyer has had his cattle weighed, they are driven the short distance to the slaughter house. This is often only a stone's throw, though, occasionally, factories are so situated that re-entraining and a short railway run are requisite. If necessary, the cattle are re-classified so that steers of one type and quality pass together to the killing floor.

It is the claim of the meat packing industry that large scale slaughtering under the factory system is perhaps the most efficient and economical link in the chain from farm to table. Quickly, and without fuss or flurry, the animals pass one by one along the narrow alley, and are stunned by a sharp blow from a four-pound hammer by a skilled worker. As the beast falls, the side of the pen automatically lowers it to the floor where it is promptly despatched by gangs of men so arranged that, as soon as one beast is disposed of, another at once takes its place. When bled and partly flayed the carcase is raised by mechanical hoist until it hangs in the well known manner by the tendons of the hind legs. It is then hitched to a forward-moving chain on an overhead rail. The moment a carcase gets on the hooks, it starts on a journey that is the height of efficiency in butchering. Every process is rapidly and neatly done while the carcase steadily moves forward. One man takes but one operation and performs it on each carcase, never leaving his allotted space of two or three feet. As one carcase is finished, he turns to receive the next, leaving all other processes to be done in turn by men who stand farther down the line. The constant doing of the same operation leads to great skill and expedition, and the output under such a system is both standardized and economical.

Inspection

At this point the all-important meat inspection service comes in. This is one of the best organized features of the Canadian meat packing industry. The corps of inspectors at each packing house—or packing "plant," in the commoner term used in the Dominion—is under the direction of the Dominion Minister of Agriculture and responsible to no one else. It is the business of the inspectors, most of whom are fully qualified veterinarians, to examine not only every carcase that goes through a packing factory, but also the detached parts of that carcase, edible or inedible. They examine particularly the parts where unsuspected disease may lurk and watch closely for any lesions that might render the flesh unsuitable for human consumption, whether they be caused by disease or by accident, such as damage due to horn goring.

An elaborate system of tagging carcases and viscera is in use. For instance, should signs of tuberculosis be found in a tongue cut from a cow, it would be necessary to identify both the tongue and the carcase from which it came and to segregate each. This has been worked out so that automatically, when disease is discovered or even suspected to be present, the carcase and all its detached parts are at once marked "Held." They are then set apart from all others and cannot again pass into the general meat supply until and unless, after re-inspection, they are specifically passed as fit by a senior veterinary inspector. Should the carcase or the parts be found all right they go back with the products duly passed as wholesome. If not, they may be condemned outright or may be partly passed, *i.e.*, the affected portion only may be removed and destroyed, while the remainder may be tagged as fit for sale. Condemned carcases and parts go into a huge tank where they are steamed under high pressure to

render them innocuous, and even then may be used only for certain kinds of stock feed or for fertilizer.

Thus, every part and tittle of a meat-yielding animal going through an inspected packing plant in Canada is subjected to a minute scrutiny by a highly qualified, independent staff of Government officials. All packinghouses doing what is known as interprovincial trade and export beyond the limits of Canada must be so inspected. There is no alternative. All carcases or parts which have stood the test and have been found suitable for food are given a hallmark of purity, the words "Canada Approved" being stamped indelibly on every carcase or on every container of such parts as are put up in boxes or packages. This is the Dominion Government's guarantee of wholesomeness in the product. Only under a system of centralized marketing and manufacture would this appear to be possible.

But the endless chain to which the steer was first attached has not ceased to progress. When the carcases are passed and marked "Canada Approved," they proceed by the same chain to the cooling room, where they are held either until sold to the domestic wholesale trade or are shipped for export.

An excellent adjunct of the Canadian meat trade is the refrigerated railway car. By means of an ice cooling arrangement, the air can be regulated and maintained at a uniformly low temperature so that meat may be kept in the best condition. Carcases are always hung from ceiling hooks. For the overseas trade, these cars are run alongside the ocean-going vessel at Montreal, Halifax or St. John, and the carcases are transferred direct to the cold storage on board.

Little need be said here of an outstanding feature of the packing house system—the utilization of by-products, or in other words, the turning to profitable account of those smaller parts of the carcases, edible and otherwise, which in the old-fashioned butchering days were openly wasted. Everything tangible is used. Over one hundred and thirty different by-products can be obtained from cattle and swine. These are used for all sorts of purposes, from sausage casings to elaborately worked up pharmaceutical and cosmetic preparations. In fact, Rudyard Kipling's skipper of the collier out of Cardiff, who " would eat clinkers to save waste," has been far outdistanced by the meat packer in his effort to save. Who has not heard that in a hog all is utilized except the squeal? These economics have resulted in benefit to farmer and consumer alike, as they tend to increase the price paid to the livestock producer and to lower the price of meat to the consumer, the difference being covered by the sale of valuable by-products.

During the last year of the war, nearly one hundred and thirty million pounds of Canadian beef was supplied to the Allied Food Purchasing Commission. That, however, could scarcely be looked upon as a criterion of normal trade. On the whole, export shipments of beef are small compared to the export of bacon. The most noteworthy effort to test possibilities under actual commercial conditions was made between May and December, 1921, when seventeen shipments, totalling 1,200,000 pounds, were sent to Liverpool by a leading abattoir company.

The following extracts from an address by the secretary of the company will give an adequate idea of the reception given this beef in England, and may indicate also some of the advantages which, given a larger supply of good beef cattle on farms, the product might enjoy on that market. It will be noticed that, as the result of his personal study of the

conditions under which the meat was sold, this officer came to the conclusion then that Canadian beef, placed upon the British market sixteen days after slaughtering in Toronto, could eventually be sold as fresh beef, in contradistinction to the chilled product shipped from other producing countries such as Argentina or South Africa.

"Between May and December, 1921," he said, "we sent to England seventeen shipments of chilled beef, totalling in weight 1,200,000 pounds. The total loss on the 1,200,000 pounds was $28,000, and we were forced to discontinue the shipments. However, an analysis of the results gives some ground for optimism. The loss on the shipments was equivalent to about one penny farthing per pound. We were convinced that the chilled beef which we shipped was worth on the British market 2*d.* per pound and probably 3*d.* per pound more than we actually received for it. And we were further convinced that, had conditions been such as to permit continuous shipments, this Canadian chilled beef would very soon have commanded a price relatively much higher than that received for our experimental shipments. Every butcher in England who handled the meat, acknowledged that it was good beef, but his attitude invariably was that it was 'imported' beef and should be bought at the imported beef price. Much of the frozen beef imported into Great Britain during the war was of very inferior quality and general prejudice was created against imported beef.

"But, if Canada could make regular shipments of chilled beef every week, what position would it ultimately establish for itself on the British market? My view is that it would in a short time command a price approximating the home killed price. The Argentine beef is marketed in England four weeks after slaughtering. Canadian beef can be marketed two weeks from the date of slaughtering. Canada has, therefore, a tremendous geographical advantage, which South America can never overcome.

"The British butcher, although he claimed that he should buy this imported beef at the imported trade price, actually paid us from 1*d.* to 2*d.* more than he was paying at the same time for South American beef. But he also did something that goes much farther in supporting my view. He sold our beef to his customers not as imported, but as home killed beef. And the only reason he was able to do this was that the beef was as good. It is this fact that gives me confidence that, granted the necessary conditions, Canadian beef would soon establish itself on a price level approximating that of home killed beef."

Early in 1923 the Dominion Department of Agriculture undertook a small experiment in exporting chilled beef to England. Only fifty carcases, totalling rather less than forty thousand pounds, were sent. Due to several causes which might not have existed under strictly commercial conditions "a decided poor return" for the consignment was reported.

Canadian Meat Industry

(Summary of Dominion Statistician's Report).

—	1921
Number of plants	84
Capital	58½ millions.
Number employees	9,928
Salaries, etc.	13½ millions.
Cattle killed	517½ thousand
Calves killed	181½ "
Sheep killed	715 "
Hogs killed	1,774½ "
Cost value, animals	86½ millions
Sales value, all products	153 "
Meats only—	
Weight	628 million lbs.
Value	124 millions

NOTE.—Values given in dollars.

Canadian Beef Exports

A very great increase in Canadian beef exports was recorded during war years. The quantity exported rose from less than a million pounds in 1912 to over 125 millions in 1919. Since then there has been a marked drop every year. The record since 1910 is as follows:—

—	United Kingdom	United Utates	Other countries	Total	Value
	lbs.	lbs.	lbs.	lbs.	$
1910	824,140	40,503	441,754	1,318,397	109,993
1911	482,371	1,957	490,083	974,411	91,844
1912	274,419	5,711	668 641	948,711	86,596
1913	782,920	19,474	768,585	1,570,979	135,111
1914	190,787	12,772,291	654,629	13,617,707	1,127,911
1915	1,330,482	17,697,917	642,302	19,670,701	1,988,489
1916	13,912,771	9,456,290	25,354,504	48,903,565	5,994,833
1917	15,179,195	10,039,593	20,327,388	45,546,176	5,750,435
1918	32,768,400	12,672,602	41,124,102	86,565,104	13,016,378
1919	91,644,900	32,965,700	1,192,300	125,802,700	26,594,814
1920	28,730,500	34,418,000	40,751,000	103,899,500	19,637,656
1921	8,883,800	36,037,700	8,585,100	53,505,600	8,504,589
1922	5,797,300	21,647,800	911,500	28,356,600	3,324,037
1923	7,987,800	18,264,000	2,776,700	29,028,500	2,932,573

NOTE.—A second article by the same author, dealing with Sheep and Swine, will be published in the March-April number.

IMPORTATION OF CANADIAN CATTLE TO GREAT BRITAIN

Representations made at the Imperial Economic Conference, 1923, by the Prime Minister for Canada and the Hon. Geo. P. Graham, Minister of Railways and Canals, extracted from *The Journal of the Ministry of Agriculture* for Great Britain, Vol. XXX, No. 8.

MR. GRAHAM: Mr. President, I am not sure just why a question of this kind should be brought before the Economic Conference unless it be to provide a jury at the trial of this question. This matter was thrashed out for a great many years, Canada strongly objecting that the reason given for shutting out her cattle that they were diseased was not founded on fact, and full investigation has proved the truth of the contention. There was no reason in our mind to exclude Canadian cattle for very many years under the Animals Diseases Act. Now, it has been stated that it is an eccentricity, I might call it, of British jurisprud-

70305—5½

ence, that you often call things by their improper names in the title of Statutes, as the question of protecting children in the cinemas, etc. Well, in that case, there was no stigma placed on cinema men, the Act was careful in its title—true to make it mean something it did not mean—but it was careful not to place any stigma on the business of the cinema men. But in this case for many years we have suffered under the allegation that cattle disease was rampant in Canada, which was not the case. I might add just here that, although in a measure the embargo has been lifted, portions of our cattle under the enforcement of regulations are still suffering from the stigma, because when an inspector, in classifying the cattle landed declares that any cattle come under what might be called the "fat class," they are slaughtered on the dock as if they were diseased cattle under the Animals Diseases Act. There is no pretension by anybody that there is any disease in the cattle, they are not slaughtered because they are diseased, but are slaughtered because they are considered not to come under the technical stocker class. We think that is an incongruity and an injustice.

To come down to 1922, I must say with brutal frankness that the Canadian people are very much disappointed. After arriving at an agreement with the British Government along certain lines, we are disappointed to find out that the Statute passed did not comply with the terms of the understanding. There was a restriction defining "store" or "stocker" cattle placed in the Act which was not considered, I believe, at the Conference between the Finance Minister of Canada, the Minister of Marine and Fisheries, and the British Government. It has been stated that that was introduced by a private Member, and while I do not wish to criticize it, as that is the business of the British Government, I am inclined to think that, if the Government had resisted the amendment, it would not have been pressed, much less passed; but that is the business of the British Government.

Now I pass on to the present difficulty, because if the Act had been passed as was discussed at the Conferance, it would have left the door much wider open. I admit that there are difficulties in passing Statutes, in enacting Statutes of Parliament, perhaps on the inside that may not be discernible on the outside. I have had experience along that line myself. We have arrived at this stage. We do think that the Act, or that portion of the Act providing for the admission of breeding cattle or cattle capable of breeding should be made operative. It must have been so intended, else it would not have been placed in the Statutes, and we feel that, while we cannot press it further, it is a fact that the British Government is not complying entirely with the understanding arrived at between the two Governments.

A matter that has not been mentioned is this. Provision has been made now for classification as between stockers and fat cattle, and we contend that that was not anticipated in the Conference. But even under the Statutes as passed which contained the new restrictive clauses this inspection has been carried on not only with a detrimental effect to the Canadian cattle trade but with an injustice to the Canadian cattle trade. Stockers have to comply with certain restrictions—branding, detention and that kind of thing—to which fat cattle are not subjected. Then stockers have to be kept separate from fat cattle, and there are various restrictions to which what we call fat fat cattle are not subject. These cattle that are shipped as stockers

from Canada arrive at the port in Great Britain, and it is our contention, we think based upon fact, that the spirit of the Act, the spirit of the arrangement is not being carried out but is being nullified by the details of the inspection. In other words, that cattle that are really stockers or store cattle and capable of being fed for weeks and months with great improvement are placed in the category of fat cattle when they arrive here, and are not even allowed to be taken a few hundred yards to another abattoir, but are slaughtered on the docks. They are slaughtered under the Animals Diseases Act though they are not diseased, with great detriment to the reputation of Canadian cattle. Further, these animals which we contend are not fat, are slaughtered and their carcases must be sold. Canadian meat of an inferior quality is thus placed on the market. It is not fed up to the point of superiority of which it is capable, and Canadian beef is put down as inferior article because the cattle are called fat by an inspector and slaughtered that neither we in Canada nor you in Great Britain would under any other circumstances think of slaughtering for the market. It is not out of place for me to give a detail or two. Several head of cattle were sent over here a few days ago by the Canadian Government as store cattle, cattle that in our country would be considered stockers, cattle that I have no hesitation in saying your farmers would call stockers if they owned them, and would feed them at least until the Christmas trade arrived. There were some 60 of these. They were all eventually put down as fat cattle and slaughtered; showing a distinct conflict of opinion between our experts in Canada and the inspectors here. I could give other details.

Another question has been raised which I do not think was ever in the mind of the British Government, and that is, inspectors have undertaken to say not only that cattle are too fat but that others are too poor. Surely that was not the intention that the inspector was to classify the animal as one that should not be sold to a farmer to fatten if he wanted to buy it. There was in one shipment of cattle carried recently quite a number of exceptionally poor cattle. I had hoped to have had the photographs of them here to-day, but they have not arrived. These cattle were not considered too fat. They were considered too poor and not of the proper class of cattle for the British farmer to fatten. That surely is an intervention with trade not contemplated in the Act. To my mind under that Statute the inspector would have just as much right to inspect a horse of mine that I was selling over here and to say it was not fit for the market. The idea and the whole intention of the Act was that cattle should come over here to be fatted, and the class of animal would be a thing between the farmer here and the seller in Canada. I only mention that to show to what extent the inspection goes.

I do not know that I need go into any more details. We are thoroughly disappointed. I could read much stronger language than I would think proper to use, but we feel that not only are our farmers disappointed after being shut out of the market for 30 years on account of diseases which did not exist but that the agreement made is being disregarded. The door opened, cattle were coming in freely, and were being sold and purchased rapidly by the farmers here for fattening, but all at once, the door is in a measure closed. Now the shutting out of these fat cattle or of cattle that are called fat by inspectors, is of a far greater moment than it may appear. It has this result, that the raisers and stock

breeders in Canada are beginning to think that there is no use in endeavouring to take advantage any more of this market because they do not know whether an animal will be declared fat when it gets over here or not, and the slaughter of all these animals so declared to be fat animals, but which we contend are not, has always been done not only with loss to the immediate interest but to the detriment of the good name of Canada and the beef which our best cattle produce.

A suggestion was made by the Minister of Agriculture as to an arrangement for the interchange of pedigree stock. Possibly it would be of some benefit, but it will not cure the situation as to the exclusion of our good grade stock which might be capable of breeding. But the immediate trouble, and the greatest disappointment we in Canada have, is the fact that cattle we sent over as we believe under the Statutes are classified so as to nullify much of the good that should come to our trade under the Statute.

Then we cannot see why we should be used differently from any other Dominion. We would not at all say that any other Dominion should be deprived of anything it has on our account. Not at all. But we believe if trade is to be Imperial the benefits must be reciprocal. It is a fact, so I am informed, and is publicly stated in our Press, in an interview with the Montreal Gazette (perhaps one of the sanest newspapers in the British Empire) that Canada's cattle do not receive the same treatment as at least one other Dominion in that their cattle after certain days of quarantine in England are allowed to be sold anywhere either as stocker or fat cattle. All those restrictions are put against our trade. As I said in the first place I am not sure this should be dealt with at the Conference as it is a matter between the Canadian Government and the British Government.

I have endeavoured to place our side of the case as dispassionately as possible before the Conference. We think the spirit of the Act is being nullified by the system of inspection, and that the advantages which were intended to be had for Imperial trade are not being experienced; and as a result of it all, the Canadian farmer feels greatly aggrieved and greatly disappointed in that he is not getting what he was assured he was to get in the way of freedom of entry for his cattle into the British market.

Mr. Mackenzie King: In the first place, I should like to mention again what I said at the opening meeting that we appreciated in Canada the difficulties with which the British Government were confronted in this matter and appreciated sincerely the action of the Government in seeing that the embargo was removed, giving admission to our cattle. We wished to do something more than give verbal appreciation of that action, and we increased the British preference, amongst other things, in the hope that the British public would realize that having met us in matter in which we were vitally concerned we, in like measure, would like to meet them in a matter which was of concern to British interests. We increased our preference by giving an additional 10 per cent discount on the existing preferential duties on all goods coming through Canadian Ports. I want to make it clear that this was done largely as the result of the action of the British Government in respect to the admission of our cattle. We intend to hold what we have done.

Our attitude in the matter of preference is one of trying to further as much as we can inter-Imperial trade. The point which I think we stress most strongly—and it is a point, I think, which is felt equally on this

side—is the importance of carrying out whatever agreements may be reached in the spirit as well as in the letter. We have no desire to do other than live up to an agreement that we have made, and we expect the British Government to adopt the same attitude, not only by itself and its Ministers, but through its officials. We think the officials should be definitely instructed as to what is the agreement and understanding in the matter. As Mr. Graham has pointed out there was a definite agreement made between the Ministers of the Crown of Canada and the Ministers of the Crown here, as to what was to constitute the provisions of an Act of Parliament. That agreement was altered somewhat by an amendment to the Act. That was a disappointment, but we realize that the Government had its difficulties in a measure of this kind when it came into the House of Commons and the House of Lords.

However, the Act itself stands for the voice of the British Parliament, and at the moment we find a further disappointment in that the Minister of Agriculture tells us distinctly that, though the act has a clause referring to the admission of breeding cattle, which has been framed with a view to giving practical expression to another phase of the agreement, he will find it impossible to introduce the Order which would give force to that clause of the Act and make it of service to us. That must necessarily occasion another considerable disappointment. It distinctly cuts down the value of the legislation and distinctly limits what we hoped and expected would be the outcome of the agreement.

Now as to the difficulties, there again let me say that our Government are prepared to be as considerate in every particular of the difficulties with which the British Government is confronted as can reasonably be expected, but there is a limit to which consideration can go. If the Act in its provisions is to be whittled away clause by clause and what is left to be completely whittled away by the method of administration, of what avail is it? That brings me to the last point, namely the administration and regulations in regard to the admission of store cattle. As Mr. Graham has pointed out, that is really very serious, because it affects our cattle in two ways. In the first place, it brings back a certain stigma which the Minister has rightly stated was never justified, and which the British Government is anxious to have removed completely, but in the second place it gives to our beef in the British market a reputation which it does not deserve. Indeed it may conceivably help to destroy the very trade it was intended to further. If we send our cattle in as store cattle, lean and thin, and with the intention of having them fattened here, and they are slaughtered immediately and put on the British market as Canadian beef, it will not take very much in the way of marketing that kind of beef to destroy any reputation our cattle may have. One can see how the farmers of Canada would naturally be very sensitive on a point of that kind. I believe if the Minister of Agriculture will say that in carrying out of the legislation he will see that instructions are given to his officials to the effect that the spirit of the law must be lived up to, and that Canadian cattle coming in as store cattle must not be put into a classification into which they should not properly be placed, he will go a long way to remove what Mr. Graham rightly referred to as a feeling of great disappointment and some indignation at the moment. I think it is entirely to the interests of British trade with Canada and our trade with Britain that irritations of that kind should not be permitted to develop. If they start on one side there

is apt to be retaliation on the other, whereas all that we want is to carry out whatever agreement we have in a spirit of goodwill and liberal interpretation.

I might mention a concrete case that was brought to my attention this morning, of a shipment of cattle that was sent over from Canada to two different ports. The single shipment was divided into two lots, one lot of 50 being sent to one port and the other lot to another port. At the one port those stockers were classified as fat cattle and slaughtered immediately. At the other port they were admitted as stockers and so regarded.

The CHAIRMAN: All out of the same lot?

Mr. MACKENZIE KING: Yes, all out of the same lot. I do not mind saying that our shippers are anxious to find out how the law is being administered. This I believe was done designedly by one shipper who divided his shipment into half and sent half to each of the two ports, at the one port they were slaughtered immediately, at the other port they were admitted and regarded as store cattle. That is an actual fact within the past week. It bears out what I say, that some of the officials of the Departments are evidently over-zealous in taking a certain course, at some ports at least, and I think that what is most needed is that the Government itself should make known to its officials the view that was expressed by the Government to our own Ministers.

IMPERIAL FRUIT SHOW, 1923

CANADIAN AWARDS

AT the Imperial Fruit Show, held in October, 1923, in Manchester, England, Canadian exhibitors secured seven first and two second prizes in the Overseas Section, one first, one third and one fourth in the British Empire Section, a second and a third in the Small Exhibits Section, and five special prizes, including the Daily Overseas Mail Gold Cup.

Three provinces competed in the Overseas Section, namely British Columbia (three entries), Quebec (three entries) and Nova Scotia (one entry). The awards in this section were as follows:

OVERSEAS SECTION

Variety	Award	Competitor
Wealthy	1st	Associated Growers of British Columbia, Limited, Vernon, B.C.
McIntosh	"	Associated Growers of British Columbia, Limited, Vernon, B.C.
Jonathan, Cox Orange, Spitzenberg	2nd	Macdonald College, P.Q.
Newton, Wagener, King, Spy, Greening	1st	Associated Growers of British Columbia, Limited, Vernon, B.C.
Any other variety	1st	Associated Growers of British Columbia, Limited, Vernon, B.C.
"	2nd	United Fruit Companies of Nova Scotia, Limited, Kentville, N.S.
Snow	1st	Morley Honey, Abbotsford, P.Q.
Blenheim	"	United Fruit Companies of Nova Scotia, Limited, Kentville, N. S.
Stark	"	United Fruit Companies of Nova Scotia, Limited, Kentville, N.S.
Golden Russet	No award	

On account of the small number of entries in this section, no third prizes were awarded.

British Empire Section

In the British Empire Section there were three entries from British Columbia and one from Quebec, the Associated Growers of British Columbia, Limited, taking first in dessert apples of any variety and fourth in cooking apples, with Macdonald College, Quebec, third in the dessert class.

Small Exhibits

In the Small Exhibits Section, H. L. Thompson, Ottawa, Ont., secured a second prize for dual-purpose apples, and the Coldstream Ranch, Vernon, B.C., a third in late culinary varieties.

Special Prizes

The following special prizes were secured by Canadian exhibitors:—

Class	Award	Competitor
Best exhibit in Overseas Section	Daily Overseas Mail Gold Cup (£50)...	Associated Growers of British Columbia Limited, Vernon, B.C.
Best entry by any British Columbia Co-operative Organization.....	Goodwin, Limited, Silver Cup (£15).	Associated Growers of British Columbia. Limited, Vernon, B.C.
Best entry by any Nova Scotia Co-operative Organization.	Goodwin, Limited, Silver Cup (£15).	United Fruit Companies of Nova Scotia, Limited, Kentville, N.S.
Best British Columbia Exhibit in Overseas Section.	Poupart, Limited, (£10 in gold.)	Associated Growers of British Columbia, Limited, Vernon, B.C.
Best Nova Scotia Exhibit in Overseas Section.	Poupart, Limited, (£10 in gold).	United Fruit Company of Nova Scotia, Limited, Kentville N.S.

ACCREDITED HERD REGISTER

Supplementary List

DURING the months of September and October, 1923, fully accredited herd certificates were issued to the following:—

PRINCE EDWARD ISLAND

HOLSTEIN-FRIESIAN

Howatt, C. M., Bradalbane.
Seaman, W. J., Bradalbane.

AYRSHIRE

Gregor, Walter M., Brackley Beach.

QUEBEC

AYRSHIRE

Black, Angus, Aubrey.
Byrne, Frank, Charlesbourg.
Coursol, A., Mont Laurier.
Coutus, Edouard, Ste. Elizabeth.
Deschamps, U., Repentigny.
Ferry, C. S., Huntingdon.
Hayes, W. T., Hemmingford.
Neily, Kerr, Huntingdon.
Paul, Napoleon, St. Germain de Grantham.
Ponton, Albert, Bromptonville.
Scott, M. G., Sweetsburg.
Sevigny, Francois, Hillhurst.
Vandal, Arthur, St. Simon de Bagot.
Whitcomb, P. J., Massawippi.
Wylie, W. C., Howick.

FRENCH CANADIAN

Coulombe, Damun, St. Norbert.

HOLSTEIN-FRIESIAN

Baker, E. F., Dunham.
Bessette, Ludger (Jr.), Richelieu.
Bromby, W. W., East Farnham.
Brown, F. L., Glenelm.
Brown, F. W., Huntingdon.
Elie, Antonio, La Baie.
Jordon, A. A., Coaticook.
Leggett, Verdun D., Herdman.
Nussey, Albert A., Brysonville.
Tannahill, H. S. & Son, Huntingdon.
Woodman, J. F., Hatley.

JERSEY

Jordan, A. A., Coaticook.
McLaughlin, O. A., Knowlton.
Poole, G. C., Hatley.

SHORTHORN

Ponton, Albert, Bromptonville.

ONTARIO

AYRSHIRE

Bradley, W. H., Landsdowne.
Canham, Geo. E., Avonmore.
Douglas, W. J., Vankleek Hill.
McCormick, T. J., Rockton.
Mode, G. D., Vankleek Hill.
Smith, R. J. A., Hatchley Station.

GUERNSEY

Dunlop, D. A., Todmorden.
Sheppard, E. R., Aurora.

HOLSTEIN-FRIESIAN

Ashford, J. E., Ancaster.
Baird, Chas., St. Marys.
Biggar, M. C., Jarvis.
Burrill, F. I., Burgessville.
Chalmers, Thos., Dorland.
Connor, B., Hagersville.
Cowie, W. J., Locust Hill.
Dippel Bros., Walkerton.
Dunlop, D. A., Todmorden.
Gough, W. H., Bloomfield.
Huff, M., Bloomfield.
Hyde, E. W., Simcoe.
Kember, Guy, Sarnia.
Kitchen, J. D. & F. D. Culver, Waterford.
Levere, Levi, Spencerville.
Lindsay, J. A., Hagersville.
McQueen, T. W., Tillsonburg.
Moir, J. G., Smiths' Falls.
Nelson, P. B., Campbellford.
Passmore, F. S., Brantford.
Rivers, W., Ingersoll.
Sager, N. P., St. George.
Sager, W. & Son, St. George.
Schweitzer, E., Stratford.
Sheppard, E. R., Aurora.
Smith, Thos., Stratford.
Stuart, H. E., Simcoe.
Wilson, C. H., Hamilton.
Wood, Geo. E., Cainsville.
Wood, W. J., Cainsville.

JERSEY

Beckett, Taylor, Ridgeville.
Sheppard, E. R., Aurora.
Thompson, M. G., Bloomfield.

SHORTHORN

Dunlop, D. A., Todmorden.
Harrop, H. A., Hagersville.

MANITOBA

ABERDEEN-ANGUS

McConnell, Geo., Hamiota.
Parrish, W. L., Parkdale.
Riverview Ranch Co. (S. S. Carscadden, Mgr.), Virden.

HEREFORD

Crawford, J. W., Pipestone.
Fallis, R. F., Souris.
Robinson, F. W., Binscarth.

HOLSTEIN-FRIESIAN

Crawford, J. W., Pipestone.
Fallis, R. F. Souris.
Parrish, W. L., Parkdale.
Robinson, F. W., Binscarth.
Wilson, R. A., Macgregor.

RED POLLED

Munro, Thos., Portage la Prairie.

SHORTHORN

Barker, John, Katrime.
Dewar Bros., Lavinia.
Forrest, W., Oak Lake.
Guild, Jas., Elkhorn.
Purves Thompson Estate, Purves.
Rice, Freeman, Binscarth.
Vopni, J. A., Harlington.
Wilkie, J., Carman.

SASKATCHEWAN

ABERDEEN-ANGUS

Buffum, G. N., Bechard.

SHORTHORN

Cuming, Henry, Kipling.
Hill, A. L., Red Jacket.
Richardson, Jas. & Son, Moosomin.

ALBERTA

HEREFORD

Sherry, J. C., Clover Bar.

HOLSTEIN-FRIESIAN

Leffingwell, F. S., Warner.
Mackid, Dr. L. S., De Winton.

SHORTHORN

Leffingwell, F. S., Warner.
Stewart, Mrs. A. I. P. & A. S. Fowler, Mazeppa.

BRITISH COLUMBIA

AYRSHIRE

Bonnett, A. E., Kettle Valley.

JERSEY

Barton, E. H., Chilliwack.
Sangster, Geo., Victoria.

CERTIFICATES CANCELLED

The following certificates have been cancelled:

AYRSHIRE

Henderson, Henry N., Huntingdon, Que.
House of Refuge, L'Orignal, Ont.

HOLSTEIN-FRIESIAN

Deeks, J. D., Morrisburg, Ont.
Farrow, Frank, Waterford, Ont.
McCullough, F. H. & Son, Navan, Ont.
Risebrough, R. J., Newtonbrook, Ont.
Wood, J. A., Merrickville, Ont.

IMPORTATION OF ANIMALS FROM THE UNITED KINGDOM PROHIBITED

Under and by virtue of the authority conferred upon me by the provisions of Section 9 of the Animal Contagious Diseases Act, (R.S.C. 1906), I do hereby order that, owing to the existence of Foot and Mouth Disease in England and Scotland, all permits for the importation to Canada from the United Kingdom, of cattle, sheep, other ruminants and swine, with the exception of such animals as are actually at this date embarked on vessels en route for Canada, shall be and are hereby cancelled.

Dated at Ottawa, this twenty-ninth day of October, one thousand nine hundred and twenty-three.

(Sgd.) A. L. Jarvis,
Acting Deputy Minister.

CATALOGUE CARDS FOR AGRICULTURAL BULLETINS

In response to an application made to the Library of Congress, Washington, D.C., to have catalogue cards printed for the bulletins of the Canadian Department of Agriculture, the Card Division has agreed to print cards prepared in the Departmental Library, International Institute Branch, for the bulletins of the Federal Department of Agriculture of Canada. These cards will be available for purchase at Washington in the near future.

NEWS ITEMS AND NOTES

Canadian exhibitors made an exceptionally good showing at the International Live Stock Exposition, Chicago, in December last, taking many of the big premiums in the cattle, sheep and horse departments, as well as the World's Championship for wheat in a field of over two hundred entries. Altogether, in the grain classes, Canadian growers carried off about one hundred awards including two of the three championships offered and five first premiums.

The many prizes won by Canada in the grain section of the International Show support the claim that Canada produces the highest quality of wheat, oats, barley, peas, and alfalfa seed. The Canadian Seed Growers' Association, Ottawa, publishes a list of growers who are in a position to fill commercial orders for Registered or Extra No. 1 seed.

The honours coming to Canada in the live stock department at the International Show, Chicago, included the grand championship for Clydesdale stallions, and the grand championship Aberdeen-Angus bull. In the sheep classes, Canada secured a number of championships, including the grand championship carload of wethers.

In the stock judging contest held at Chicago, open to Agricultural Colleges, the Ontario Agricultural College team took second place, being thirteen points behind the winner, the Kansas State College. The individual championship as best student judge, was won by G. R. Patterson of the Ontario College, with a score of 908 points out a possible 1000.

According to an announcement made by the Minister of Finance, the Hon. W. S. Fielding, Dr. H. M. Tory, President of the University of Alberta, has been appointed by the Government to enquire into and report upon the question of agricultural credits, with particular reference to the recommendations for enquiry made by the special committee on Agriculture of the House of Commons last session.

The Live Stock Commissioner for Canada has issued Report No. 3 on "The Origin and Quality of Commercial Live Stock Marketed in Canada, 1920-21-22". The report, which is mainly statistical, reveals the sources of the best and poorest offerings as well as the surplus volume of the different classes of live stock by provinces and districts, and is intended chiefly for the information of those engaged in promotion and extension work.

"With a few notable exceptions", states the Commissioner, "the report reveals a very urgent need for greater economy in production. Live stock is the medium through which the bulk of our fodder and coarse grain crops is marketed, yet practically every so-called live stock district is marketing an astonishingly small tonnage of good quality beef, pork and mutton. Lack of proper feeding appears to be more general than lack of good breeding."

At the National Dairy Show in London, Canadian bacon was awarded a first prize in the colonial bacon class. The winning exhibit compared favourably with any of the bacon shown, and demonstrated that if furnished with the right type of bacon hog, Canadian bacon curers need not fear competition in the British market so far as quality is concerned.

A notable increase is shown in the number of animals of the different dairy breeds recorded in Report No. 15 of the Record of Performance of Pure-Bred Dairy Cattle recently published by the Dominion Live Stock Branch. In the 305-day division, or Honour Roll, Ayrshires show a numerical increase of 74 compared with the previous year's report; Holstein-Friesians an increase of 71, Jerseys of 90, and Shorthorns of 11. In the 365-day division, Jerseys have the largest increase, namely 159, of which 52 are in the mature class and 73 in the two-year-old. A marked increase in registration is that of the Guernseys, which number 64 compared with 24 the year before. The number of animals recorded of the French Canadian breed is 25 compared with 10 the previous year, and of Red Polled, 9 compared with 2.

Changes have been made in the arrangement of the Report whereby information is compiled in a more compact form, the name of the cow, its parentage, owner, breeder, dates of test and calving, times milked daily, total production of milk and fat, percentage days in milk, and R.O.P. number all being given under one entry. The other contents of the Report are requirements of registration, a list of bulls of each breed, qualified for registration since the commencement of the test, with their qualified progeny, and a complete index of the owners, etc.

The Director of the Agricultural School at Olds, Alberta, Mr. F. S. Grisdale, reports a yield of 105 bushels of Marquis wheat from one acre at the demonstration farm connected with the School. The wheat graded No. 1 Northern, and the yield probably constitutes a record for the Province. The same farm secured 105 bushels of oats from a single acre, and from 27 acres of barley, 70 bushels per acre were obtained while another variety of barley averaged 80 bushels for 10 acres.

Interest among poultry breeders in the Record of Performance for Poultry, conducted by the Dominion Live Stock Branch, is increasing each year. From a moderate beginning with 67 breeders entering 4,436 birds in 1919-20, the entries for the season ended November 30, 1923, were 175 breeders and 12,286 birds.

A breeder may enter any number of birds and, in the event of a bird laying 150 eggs in 52 consecutive weeks, is given a Record of Performance certificate to cover that bird's production. If a bird lays 225 eggs in 52 consecutive weeks the breeder is given an advanced certificate. The tests are carried out on the breeder's own plant under systematic inspection by officers of the Dominion Live Stock Branch. As the breeders entered are carrying on pedigreed breeding, the work is likely in course of time to have a beneficial influence on the poultry industry generally.

In several cities of the Dominion, eggs are now being sold on grade on the public market, in accordance with the Regulations respecting the Grading and Marking of Eggs, which became effective in July, 1923, and are administered by the Dominion Live Stock Branch. The regulations in this connection provide that every case or container of eggs exposed, displayed or offered for sale direct to consumers in a public place or manner is to be marked with the name of the class and grade of eggs in the container. In every instance where eggs are being inspected the market authorities have assisted the federal officers and have provided the facilities for grading.

New Zealand, has recently become the largest exporter of both cheese and butter In 1900 Canada's production of cheese was 220,833,269 pounds; in 1922 it was 134,530,053 pounds. In 1903 Canada contributed 68 per cent of the cheese imported by the United Kingdom, and in 1914, 51 per cent. In 1922 Canada supplied 39 per cent while New Zealand supplied 50 per cent compared with 28 per cent in 1914. If Canada would regain for her cheese the place she formerly held in the British Markets it is plain that she must adopt progressive measures such as that inaugurated last year providing for the official grading of factory cheese and butter intended for export. Otherwise our dairymen are likely to discover that their market has slipped away from them.

Up to the end of October, 1923, according to Dominion Live Stock Branch reports, Great Britain had taken from Canada 48,656 cattle compared with 16,346 in the same period last year; 5,210,100 pounds of beef compared with 4,676,400 pounds; 80,598,800 pounds of bacon compared with 78,340,600 pounds; 2,032,700 pounds of pork compared with 155,900 pounds and 29,500 pounds of mutton compared with 34,100 pounds. The United States took 62,878 cattle compared with 141,867; 22,182 calves compared with 21,508; 19,406 sheep compared with 79,543; 10,314,-400 pounds of beef compared with 14,276,-400; 122,800 pounds of bacon compared with 133,600 pounds; 605,300 pounds of pork compared with 448,900 and 1,184,-900 pounds of mutton compared with 4,291,400 pounds.

From the St. Thomas laboratory for the production of the corn borer parasite, *Habrobracon*, some 585,000 specimens were liberated at centres of infestation during the season of 1923, according to the Dominion Entomologist.

During the season 1921-22, Bermuda imported 7,094 barrels of seed potatoes of the Garnet variety from the Province of Nova Scotia. The inspection authorities in Bermuda report that the stock was of good quality and true to type. In the later shipments the filling of the barrels showed an improvement. The Province of New Brunswick supplied an unstated quantity of the Triumph variety, and other stock was reported as good both in shape and colour.

The University of Saskatchewan is building an Animal Research Laboratory, which should prove of great value to the Province in investigating various diseases affecting live stock.

The Province of Ontario made a very creditable showing at the National Dairy Show held at London, England, in October last. The exhibit of butter from the Ontario Department of Agriculture was awarded a gold medal. The first prize for cheese went to a factory in Eastern Ontario. For eggs, first place was secured with an exhibit of graded eggs supplied by the

associated egg circles of Oxford county, while for honey the first prize was won by a beekeeper in Durham county.

Saskatchewan bids fair, in the very near future, to be the leading producer of turkeys in North America. At her present rate she will exceed before long the turkey production of any single province or state.

The success attending the Corn Show held by the Saskatchewan Corn Growers' Association at Maple Creek, Sask., in November last, is an indication of the marked interest in corn growing now taking place in the prairie provinces. The area devoted to the crop was 13,000 acres in 1913, mostly in Southern Manitoba. By 1922 it had increased to 83,000 acres, while in 1923 it increased still further, although figures are not yet available. The extension of the crop will be encouraged by the extent of the development of early maturing varieties having a good grain yield, such as are now making their appearance. All the prairie provinces were represented at the Show.

The following is the student enrolment at the College of Agriculture, University of Alberta, Edmonton, for the current year:—

B.S.A. Degree Course	
1st year	24
2nd "	12
3rd "	11
B. Sc. Degree Course	
1st year	11
2nd "	2
3rd "	14
4th "	10
Arts and Agriculture	
Combined Course	5
Household Economic Course	
Degree Course	6
Graduate students	9

This year for the first time the institution is offering a four-year course with matriculation entrance requirement. This course will for the present be known as the B.Sc. course to distinguish it from the three-year course leading to the degree of B.S.A. It will be discontinued as soon as circumstances permit.

At the Pacific North West Potato Show held in Spokane, U.S.A., November 20-23, British Columbia growers captured all prizes in the certified seed miscellaneous class, and made a very creditable showing in all other classes.

APPOINTMENTS AND STAFF CHANGES

G. D. Matthews, B.S.A., (McGill), has been appointed Assistant Superintendent in charge of Cereal and Forage Crop Investigation at the Dominion Experimental Farm, Indian Head, Sask.; Richard Rankin Hurst, Assistant Plant Pathologist, Saskatoon, Sask.; William Gilbert P. Garlick Assistant Entomologist, Vineland, Ont.; and Hugh Moyle Greenwood, Poultry Inspector, Ottawa.

The University of Saskatchewan announces the following appointments to the Faculty: Seymour Hadwin, D.V.S. (McGill), Research Professor of Animal Diseases (new); A. J. G. Maw, B.S.A., (Macdonald), Instructor in Poultry Husbandry (new); Truman Stevenson, B.S.A., Instructor in Field Husbandry; and E. A. Howie, B.S.A., Assistant in Dairying.

Mr. W. W. Fraser, who for the past seven years has been Manitoba's Live Stock Commissioner, recently tendered his resignation to the Provincial Government. It is understood that Jas. R. Bell, formerly District Representative at Portage la Prairie and lately appointed Live Stock Specialist on the Extension Department, will take over Mr. Fraser's duties.

ASSOCIATIONS AND SOCIETIES

Entomological Society of Ontario.—The sixtieth anniversary of the founding of the Entomological Society of Ontario was celebrated by holding a series of meetings in Ottawa, November 1-3, 1923. The regular sessions were held in the Exhibition Room of the Dominion Entomological Branch. About seventy-five attended the meetings, and thirty-five papers were presented. A public address was given by Dr. A. F. Burgess of the United States Bureau of Entomology, on the "Value of Natural Enemies of Injurious Insects". The annual dinner was held at the University Club, Professor Lochhead of Macdonald College being chairman. Dr. Bethune, the oldest living charter member, sent an interesting paper reviewing the early history of the Society. The paper was read by Mr. Arthur Gibson, Dominion Entomologist. President Morris gave a paper on the works of W. H. Hudson, "Nature's Clairvoyant". On the last day of the gathering, European Corn Borer moving pictures were shown, as well as a number of reels on wild life. The Society visited the Parliament Buildings and, after a luncheon, were taken on a motor trip around the city and to view the chrysanthemum show at the Experimental Farm.

Papers were presented by the following members of the Entomological Branch staff: Messrs. Arthur Gibson, H. A. Robertson, A. G. Dustan, C. Howard Curran, Norman Criddle, Arthur Kelsall, W. A. Ross, L. S. McLaine, H. E. Gray, G. H. Hammond, T. Armstrong, H. F. Hudson, A. A. Wood, J. M. Swaine, H. L. Viereck, W. N. Keenan, H. G. Crawford, C. B. Hutchings, J. D. Tothill, and C. R. Twinn.

The following were elected officers of the Society for the year 1924: President, J. M. Swaine; Vice-president, R. C. Treherne; Secretary-Treasurer, A. W. Baker; Editor, *Canadian Entomologist*, J. H. McDunnough.

Ontario Fox Breeders' Association.—Membership in the Ontario Fox Breeders' Association is restricted to breeders who are members of the Canadian Silver Fox Breeders' Association. Foxes on the ranches of these breeders are subject to inspection by inspectors of the Federal Government, and, on passing inspection, are tatooed with the letters and numbers of the owner.

The officers of the new association are as follows: President, E. C. H. Tisdale, Beaverton; Vice-President, W. H. C. Ruthven, Alliston; Secretary-Treasurer, C. K. Walton, Oakville.

Canadian Association of Exhibitions.—As a result of a conference of the representatives of Class A, or principal fairs and exhibitions throughout Canada, held at Ottawa in November, 1923, an organization was inaugurated known as the Canadian Association of Exhibitions.

Provisional officers were elected as follows: President, D. T. Elderkin, Regina, Sask.; Vice-President, J. K. Paisley, Ottawa; Secretary-Treasurer, S. W. Johns, Saskatoon, Sask.

The board of directors will consist of one representative from each member, the membership in the association being open to all Class A exhibitions in Canada, also winter and spring shows receiving federal aid.

Associations not represented at the meeting have the privilege of naming their own directors should they decide to join the new association. The associations represented at the meeting and directors elected were:

Charlottetown, P.E.I., Charles R. Smallwood; St. John, N.B., H. A. Porter; Fredericton, N.B., Mr. Cooper; Quebec, Georges Morrisette; Three Rivers, Dr. J. H. Vigneau; Sherbrooke, Que., S. E. Francis; Ottawa, J. K. Paisley; Toronto, J. G. Kent; Brandon, J. E. Rettie; Regina, D. T. Elderkin; Saskatoon, S. W. Johns; Edmonton, W. J. Stark; Calgary, E. L. Richardson; Vancouver, H. S. Rolston; New Westminster, D. E. MacKenzie; Amherst, N.S., S. A. Logan.

The President, Vice-President, and Secretary-Treasurer, were constituted a committee to draft a constitution. The first annual meeting will be held in Toronto during, or immediately after, the Royal Winter Fair of 1924.

Prince Edward Island Egg and Poultry Association.—President, John R. Munn, Marshfield; Secretary, Geo. Lightizer, Charlottetown.

Prince Edward Island Swine Growers' Association.—President, Peter Brodie, York; Secretary, W. J. Gibson, Marshfield.

Prince Edward Island Beekeepers' Association.—President, Robt. Moase, Kensington; Vice-President, H. H. Taylor, Charlottetown Experimental Station; Secretary-Treasurer, Harold Newsom, Charlottetown.

Alberta Hereford Breeders' Association.—President, O. A. Boggs, Daysland; Vice-President, John Wilson, Innisfail; Secretary-Treasurer, Thomas Bellew, Calgary.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Report of the Director, E. S. Archibald, B.A., B.S.A., for the year ending March 31, 1923. Dominion Experimental Farms.

Experimental Station, Cap Rouge, Que., 1922.—Report of the Superintendent, G.A. Langelier, D. Sc. A. Dominion Experimental Farms.

Experimental Station, Kentville, N.S., 1922—Report of the Superintendent, W. Saxby Blair. Dominion Experimental Farms.

Experimental Farm, Nappan, N.S., 1922—Report of the Superintendent, W. W. Baird, B.S.A. Dominion Experimental Farms.

Experimental Station, Fredericton, N.B., 1922.—Report of the Superintendent, C.F. Bailey, B.S.A. Dominion Experimental Farms.

Tobacco Division, 1922.—Report of the Officer in Charge, F. Charlan. Dominion Experimental Farms.

Poultry Division, 1922.—Report of the Dominion Poultry Husbandman, F. C. Elford. Dominion Experimental Farms.

Report of the Dominion Entomologist, Arthur Gibson, F.R.S.C., F.E.S.A., for the two years 1919 and 1920.

Dairy Industry Act, 1914, as Amended in 1923.—Administered by the Dairy and Cold Storage Branch. Acts, Orders and Regulations No. 13.

Live Stock Shippers' Guide.—How to Move Commercial and Exhibition Stock, by L. L. Cooke, Transportation Specialist, and P. E. Light, B.S.A., Markets Intelligence Service. Live Stock Branch. Pamphlet No. 38—New Series.

The Origin and Quality of Commercial Live Stock Marketed in Canada, 1920-21-22.—Report No. 3. Markets Intelligence and Stock Yards Service, Live Stock Branch.

The Canadian Record of Performance for Pure-Bred Dairy Cattle.—Regulations, Standards and Records of Cows Qualified for Registration. Report No. 15. Live Stock Branch.

Insects Affecting Live Stock.—Bulletin No. 29—New Series. By S. Hadwen.

Seed, Feed and Fertilizer Markets.—Current Wholesale and Retail Prices and Other Information relating to the Sale of Seed, Feed and Fertilizer in Canada. Statements with regard to markets are based on information supplied by Seed Branch correspondents under special arrangement. Dominion Seed Branch. Issued every two weeks.

Bees and How to Keep Them.—By C. B. Gooderham, B.S.A., Dominion Apiarist. Bulletin No. 33—New Series. (Revised from Bulletin No. 26). Bee Division.

Biological Notes on Parasites of Prairie Cutworms.—By E. H. Strickland. Bulletin No. 26—New Series (Technical).

How Should Canada Export Beef Cattle.—An Experiment in the Shipment of Live Cattle and Chilled Beef to England conducted by the Experimental Farms Branch. Pamphlet No. 39—New Series. Animal Husbandry Division.

The Maple Sugar Industry in Canada.—By J. B. Spencer, Director of Publicity. (Third Edition). Bulletin No. 30—New Series.

The Fertilizer Act, 1922.—With Regulations made by the Minister of Agriculture. Administered by the Seed Branch. Acts, Orders and Regulations No. 9.

The Seeds Act, 1923.—With regulations made by the Minister of Agriculture. Administered by the Seed Branch. Acts, Orders and Regulations, No. 11.

The Feeding Stuffs Act.—With Amendments and Regulations. Administered by the Seed Branch. Acts, Orders and Regulations No. 10.

ONTARIO

Ontario Agricultural College and Experimental Farm, 1922.—Forty-eighth Annual Report.

Fruit Growers' Association of Ontario, 1922.—Fifty-fourth Annual Report.

Live Stock Branch, 1922.—Annual Report.
Twenty-third Annual Report of the Agricultural Societies and of the Convention of the Association of Fairs and Exhibitions, 1923.

Statistics Branch, 1922.—Annual Report. Part I.—Agricultural Statistics. Part II.—Chattel Mortgages.

Report of the Stallion Enrolment Board of Ontario, 1923.

A Few of the Leading O.A.C. Varieties of Grain Crops.—By Charles A. Zavitz, B.S.A., D.Sc., Professor of Field Husbandry and Director of Plant Breeding and of Field Experiments. Circular No. 42.

Preliminary Soil Survey of Southwestern Ontario.—By Prof. R. Harcourt, W. L. Iveson and C. A. Cline, Department of Chemistry. Ontario Agricultural College. Bulletin No. 298.

Insecticides and Fungicides.—By H. L. Fulmer, B.S.A., M.A., Associate Professor of Chemistry. Bulletin 302. (A revised edition of No. 195). Ontario Agricultural College.

The Brood Sow.—By R. G. Knox, B.S.A., Lecturer in Animal Husbandry, and Wade Toole, B.S.A., M.S., Professor of Animal Husbandry. Ontario Agricultural College. Bulletin No. 301.

QUEBEC

Dairymen's Association of the Province of Quebec, 1922.—Forty-first Report. Supplement to the report of the Honourable Minister of Agriculture.

MANITOBA

Weeds of Manitoba.—Extension Bulletin No. 73. Superseding Extension Bulletin No. 30. By V. W. Jackson, Professor of Botany, Manitoba Agricultural College.

SASKATCHEWAN

Sixteenth Annual Report of the Secretary of Statistics for the Fiscal Year ended April 30, 1923.

ALBERTA

Potato Seed Treatment.—By G. H. Cutler and G. B. Sanford, Department of Field Husbandry, College of Agriculture, University of Alberta. Circular No. 1.

Plows and Plowing.—By J. MacGregor Smith, Department of Agricultural Engineering, College of Agriculture, University of Alberta. Bulletin No. 6.

The Production of Fall Pigs in Alberta.—By J. P. Sackville, Professor of Animal Husbandry and R. D. Sinclair, Assistant Professor of Animal Husbandry. Bulletin No. 7.

Altaswede Red Clover.—By G. H. Cutler and G. F. H. Buckley, Department of Field Husbandry, College of Agriculture, University of Alberta. Bulletin No. 4.

Growing Registered Seed in Alberta.—By G. H. Cutler and J. R. Fryer, Department of Field Husbandry, College of Agriculture, University of Alberta. Bulletin No. 3.

BRITISH COLUMBIA

Seventeenth Annual Report of the Department of Agriculture, 1922.

Tomato-growing in British Columbia.—By R. P. Murray, District Field Inspector. Circular No. 65 (New Horticultural Series) Horticultural Branch.

Certified Seed-Potatoes—Why They Will Pay.—By C. Tice, B.S.A., Acting Chief Soil and Crop Instructor and Potato Specialist. Soil and Crop Circular No. 1.

Entomological Society of British Columbia.—Proceedings, 1923. Nos. 17 and 19—Economic Series.

MISCELLANEOUS

Canadian National Record for Foxes.—Volume 2. Containing the pedigrees of foxes inspected and registered 1922. Edited in the office of the Canadian Nation Live Stock Records, Ottawa, and published by the Canadian Silver Fox Breeders' Association.

Canadian Thoroughbred Stud Book.—Volume 2. Compiled and edited in the office of the Canadian National Live Stock Records, Ottawa, and published by the Canadian Thoroughbred Horse Society.

Sanitation.—Safe Water Supplies for Isolated Houses and Institutions where Municipal System is not Available. By B. Evan Parry, M.R.A.I.C., Supervising Architect. Publication No. 17. (Unabridged edition). Issued by the Department of Health, Canada.

70305—6

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

The encyclopedia of food, published by Artemas Ward. New York, 1923. 596 p. il. col. plates.

Textbook of agricultural bacteriology, by F. Löhnis, Ph.D. and E. B. Fred, Ph.D. New York. McGraw-Hill book co. inc. 1923. 283 p. il. (Agricultural and biological publications; Charles V. Piper, consulting editor).

Vegetable crops, by Homer C. Thompson, B.Sc. New York, McGraw-Hill book co. inc. 1923. 478 p. il. (Agricultural and biological publications; Charles V. Piper, consulting editor).

British mammals, written and illustrated by A. Thorburn, F.Z.S. London, Longmans, Green & Co., 1921. 2 vols. il. col. plates.

The soybean, by Charles V. Piper, M.S., D.S., and William J. Morse, B.S.A. New York, McGraw-Hill book co. inc. 1923. 329 p. il. (Agricultural and biological publications, C.V. Piper, consulting editor).

Miscellaneous papers in agricultural economics, Vol. II, 1919-1922. Oxford, Institute for research in agricultural economics, 1923. v. p.

The rose in America. by J. Horace McFarland. New York, Macmillan co. 1923. 233 p. il.

Farm mortgage financing, by Ivan Wright. New York. McGraw-Hill book co. inc. 1923. 343 p. Bibl. pp. 249-261.

New guide to reference books, by I. G. Mudge. Chicago, American library association, 1923. 278 p.

The nature and properties of soils; a college text of edaphology, by T. Lyttleton Lyon and H. O. Buckman. New York, Macmillan co. 1923. 588 p. il.

Farmer's shop book, by Louis M. Roehl. Milwaukee, Wis. Bruce publishing co. 1923. 429 p. il.

Organized co-operation, by John J. Dillon. New York, Rural New Yorker, 1923. 134 p.

The social center, edited by E. J. Ward. New York, D. Appleton and co. 1917. 359 p. (National municipal league series).

Milk; an interim report of the New South Wales Board of trade upon the conditions of production and distribution of certain commodities. Sydney, James Kent, 1923. 211 p.

Evolution, heredity and eugenics, by J. M. Coulter. Bloomington, Ill. J. G. Coulter, publisher, 1916. 134 p. il. (School science series No. 5).

Interim reports: Milk and milk products; Meat, poultry and eggs; Fruit and vegetables. 1923. Gt. Brit. Ministry of agriculture & fisheries. Departmental committee on distribution and prices of agricultural produce.

Undernutrition in steers; its relation to metabolism, digestion, and subsequent realimentation, by F. G. Benedict and E. G. Ritzman. Washington, Carnegie Institution of Washington, 1923. 333 p. il (Publication, 324).

The phylogenetic method in taxonomy, by Harvey M. Hall and F. E. Clements, Washington, Carnegie Institution of Washington, 1923. 335 p. il. (Publication 326).

Veterinary hygiene by Dr. Martin Klimmer; translated by A. A. Leibold, D.V.M. Chicago, Alexander Eger, 1923. 431 p. il.

The American live stock and meat industry, by R. Alexander Clemen, M.A. New York, Ronald press co. 1923. 872 p. il.

Animal nutrition, by E. T. Halnan, M.A. London, Benn bros. ltd. 1923. 52 p. il.

Farm meats, by M. D. Helser, B.S.A. Toronto, Macmillan co. of Canada, 1923. 274 p. il.

Economics for commercial students, by Albert Crew. London, Jordan & sons, 1923. 384 p.

Le travailleur agricole francais, par Georges Risler. Paris, Payot et cie, 1923. 281 p.

L'agriculture commercialisee, par Armand Bonat. Paris, Librairie agricole de la maison rustique. 348 p. il.

Economie rurale, par E. Jouzier. Paris, Librairie J. B. Bailliere et fils, 1920. 550 p.

An introduction to statistical methods, by Horace Secrist, Ph.D. Toronto, Macmillan co. of Canada, 1917. 482 p. il.

Practical landscape gardening, by R. B. Cridland. New York, A. T. De La Mare co. inc. 1922. 276 p. il. plans.

Range & pasture management, by A. W. Simpson, M.A. New York. John Wiley & sons, 1923. 421 p. il.

The enemies of the rose, by G. Massie and F. V. Theobald. London, National rose society. 110 p. il.

Fundamentals of educational measurement, by C. A. Gregory, Ph.D. New York, D. Appleton & co. 1923. 382 p.

Eugenics, genetics and the family; eugenics in race and state. Baltimore, Williams & Wilkins co. 1923. 2 vols. (Scientific papers of the International congress of eugenics).

Microscopical examination of foods and drugs, by H. G. Greenish, F.I.C. Philadelphia, P. Blakiston's son & co. 1923. 3d ed. 386 p. il.

Smith's college chemistry revised and rewritten, by James Kendall. New York Century co. 1923. 747 p. il.

Chemistry applied to home and community by Pauline Beery, A.M. Philadelphia, J. B. Lippincott co. 1923. 534 p. il.

Farm fertility, by S. B. Haskell. New York, Harper & bros. 1923. 243 p.

From the Greeks to Darwin, by H. F Osborn, Sc.D. Toronto, Macmillan co. of Canada, 1922. 259 p.

Outline of genetics, by M. C. Coulter. Chicago, University of Chicago press, 1923. 211 p.

Notes of a Catholic biologist, by Rev. G. A. Kreidal. St. Louis, B. Herder book co. 1922. 276 p.

The laws of life, by W. M. Goldsmith Ph.D. Boston, R. G. Badger, 1922. 441 p., il.

Student's manual of exercises in elementary biology, by B. C. Gruenberg and F. W. Wheat. New York, Ginn & co. 1923. 162 p. il.

International year book of agricultural legislation, 1922. Rome, International institute of agriculture, 1923. 1056 p.

International year book of agricultural statistics, 1922. Rome, International institute of agriculture, 1923. 364 p.

Zoology, a textbook for universities, colleges and normal schools, by T. W. Galloway, Ph.D. and P. S. Welch, Ph.D. Philadelphia, P. Blakiston's son & co. 1922. 558 p. il.

Animal life and intelligence, by C. Lloyd Morgan. London, E. Arnold, 1890. 512 p. il.

Agricultural organization in the United States, by Edward Wiest. Lexington, Ky. 1923. 618p.

The chemical basis of growth and senescence, by T. B. Robertson. Philadelphia, J. B. Lippincott co. 1923. 395p. (Monographs on experimental biology).

Canada and Newfoundland gazetteer and business directory, 1923. Toronto, Canadian gazetteer publishing co. 1923. 1782 p.

Home economics for schools, by Agnes K. Hanna. Boston, Whitcomb and Barrows, 1922. 327 p.

Horticulture for schools, by A. V. Stubenrauch, Milo N. Wood and C. J. Booth New York, Macmillan co. 1922. 325 p. il.

Furs and the fur trade, by J. C. Sachs London, Sir Isaac Pitman and sons, ltd. 1923. 128 p. il.

Laboratory outlines for general botany; 5th ed. by John H. Schaffner. Columbus, O. 1922. 130 p. il.

The administration of schools in the cities of the Dominion of Canada, by W. L. Richardson. Toronto, J. M. Dent & Sons, ltd. 1922. 315 p.

Railroads and business prosperity, edited by T. W. Van Metre and P. T. Moon New York, 1922. 130 p. (Academy of. political science in the City of New York. Proc. July 1922).

The vegetation of Long Island, Part I. The vegetation of Montauk; a study of grassland and forest, by Norman Taylor. Brooklyn, Brooklyn botanic garden, 1923. 107 p. il. (Memoirs Vol. II).

International congress on cattle breeding. Proceedings. The Hague, 1923. v.p.

The British association for the advancement of science; a retrospect 1831-1921, by O. J. R. Howarth, O.B.E., M.A., secretary. London, 1922. 318 p. il.

Treaties, conventions, international acts, protocols, and agreements between the United States of America and other powers, 1910-1923. Vol. III 1923. Washington, D.C. Government printing office, 1923. 3918 p.

The co-operative marketing of farm products, by O. B. Jesness, B.S.A. Philadelphia, J. B. Lippincott co. 1923. 305 p. il.

Co-operative marketing, by Herman Steen. Toronto, Doubleday, Page & co. 1923. 366 p. il.

A dictionary of applied physics, ed. by Sir Richard Glazebrook, K.C.B. Toronto, Macmillan co. of Canada, 1922-23. 5 vols.

Handbuch der landwirtschaftlichen pflanzenzuchtung, by C. Fruwirth. Berlin, Paul Parey, 1922-23. 5 vols.

Landwirtschaftliche samenkunde, by Dr. Phil. Ludwig Wittmack. Berlin, Paul Parey, 1922. 581 p. il.

Frost und licht als beeinflussende kraft bei der samenkeimung, by Wilhelm Kinzel. Stuggart, E. Ulmer, 1913-1920. 3 vols.

The age of mammals in Europe, Asia and North America, by H. F. Osborn. Toronto, Macmillan co. of Canada, 1921. 635 p. il.

Animals of the past, by F. A. Lucas. New York. American museum of natural history, 1922. 207 p. il. 6th ed.

Fundamentals of organic and biological chemistry, by T. G. Phillips, Ph.D. New York. D. Appleton & co. 1923. 260 p.

Les comptes a la ferme; comment je tenais mes comptes, par A. Sibille. Paris, Librairie agricole de la maison rustique, 1923. 184 p. il.

Les principales maladies des habitants de la basse-cour, par G. Moussu. Paris, Librairie agricole de la maison rustique. 267 p. il.

The evolution of breeds, by D. F. Malin. Des Moines, Iowa, Wallace publishing co. 1923. 278 p. il.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

THE INSTITUTE'S PUBLICATIONS

The following are the bulletins and the more important of the other publications issued by the International Institute of Agriculture, with subscription prices:

The International Crop Report and Agricultural Statistics.—This bulletin is published monthly on the Thursday nearest the 20th. It contains three parts.

The part devoted to *Production* gives, as it were, a picture of the world-situation as to the areas and the production of the most important agricultural products (cereals, potatoes, vines, sugar, cotton, etc.). The Institute, which receives its information to a large extent telegraphically, furnishes the most recent data compared with the data corresponding for the previous year and with those for the preceding quinquennial period; besides news concerning weather, crop conditions, sowings, harvest prospects, etc. Each number of the said publication will contain detailed statistics on the number of *live stock* existing in the different countries.

The part devoted to *Trade* will comprise a series of tables containing data relative to the imports and exports of the different countries, by seasons and by months for the following products: wheat, wheat flour, rye, barley, oats, maize, rice, linseed, cotton and tea.

By consulting the tables of *Prices* the reader will be able to compare the recent prices of cereals and of cotton on the various markets of the world, with an extensive list of previous prices, thus obtaining a true knowledge of the tendencies of these markets; this comparison will be facilitated also by the index numbers of the various prices which are inserted.

The area and production of crops are now given in the crop report in acres and centals.

Subscribers to the *International Crop Report and Agricultural Statistics* will receive free during the year two summarized statements of the world's cereal requirements and supplies.

The annual subscription price is $3.00.

The *International Review of the Science and Practice of Agriculture* is published quarterly. Each issue will contain about 250 pages.

Part I of the Review will include original articles by recognized authorities dealing with important agricultural problems of world-wide interest. Part II will include technical information obtained from all parts of the world. Part III will consist of notices concerning the outstanding events from the agricultural standpoint such as conferences, exhibitions, shows, etc.

The annual subscription is $3.00.

The *International Review of Agricultural Economics.* is also published quarterly. It will continue to deal with agricultural co-operation, agricultural insurance, credit, the economic and social conditions of the agricultural classes, land systems, etc. An attempt will be made to give greater variety and greater general interest to the articles by having recourse to outside contributors.

Attention might be drawn to the fact that two very valuable articles on Canadian subjects were published in recent numbers of the Review: "Rural Credits in Canada" by Professor W. T. Jackman of Toronto University, and "Co-operation for the Marketing of Agricultural Produce and the Supply of Farm Requisites in Canada," by W. E. H. Lang, of the staff of the Institute Bureau of Economic and Social Intelligence. These two articles have lately been published as separate pamphlets.

The annual subscription for the Review is $2 00.

The subscription price for all three of the above mentioned publications taken together is $6.00.

The twelfth volume of the *International Year Book of Agricultural Legislation* has just been issued. It contains the more important legislation on agriculture enacted in the different countries in 1922. Although published in the French language only

there is a lengthy analytical introduction in English which gives synopses of many of the laws given in detail in the text. The price of the volume is 60 francs.

The *International Year Book of Agricultural Statistics*, 1922. The most complete work of its kind published. It is arranged for both English and French readers. Price, $2 00.

Other Publications

Commerce International du Betail et de ses Derives (Statistical Tables) 136 pages, 8 francs.

Produits Oleagineux et Huiles Vegetales (a statistical study of their production and trade) 443 pages, 20 francs.

The Landschaften and Their Mortgage Credit Operations in Germany, 90 pages, 3 francs.

Profit Sharing in Agriculture in Great Britain and Ireland, 24 pages, 1 franc.

The Present Organization of the Services for the Control of Plant Diseases in the Different Countries, 25 cents.

How to Subscribe

Anyone wishing to subscribe to any of the Institute's bulletins or other publications should have a post office order made out payable to the International Institute of Agriculture, Rome, Italy, and either forward it direct to the Institute or through this office. The prices quoted above in all cases include packing and postage charges.

MOVEMENT TO IMPROVE, EXTEND AND POPULARIZE THE ENGLISH EDITIONS—STRONG SUPPORT OF THE INSTITUTE BY OTHER CONSPICUOUS INTERNATIONAL BODIES

The American delegation of eleven members, who attended the last General Assembly meetings of the Institute in May, 1922, moved that English be made the official language of the Institute as well as French in all its proceedings and publications. The principle was accepted in that the English and French languages were adopted for the discussions, resolutions and orders of the day of the General Assembly. A summary of these speeches was repeated in French or English by an authorized interpreter. As for editions of the different publications in languages other than the French the extra expense involved was to be defrayed by each group of countries interested by both direct Government contributions and private subscriptions. This is practically the policy being followed. Great Britain, the self-governing Dominions and the United States have been paying special contributions for the translations into English and, in so far as the Government contributions and the private subscriptions meet the requisite additional expenditure, the Institute's policy is further to extend publication in English to publications other than the three monthly periodicals.

Now that the scientific and practical value of the publications is universally recognized the Institute was confident that the number of private subscriptions would continue to multiply even more rapidly than they had done during the preceding year.

The Commissioner of this Branch has just received from the delegate of the United States on the Permanent Committee, Mr. Asher Hobson, a letter in which the latter states that one of the questions to be submitted by the United States Government for consideration at the next General Assembly is the following:—

"The United States recommends that American equivalents of weights and measures (acres and bushels) be used in the publications of the Institute that are to be distributed in the United States and Canada."

It is not improbable that all the English speaking countries will support this resolution and that it will be adopted. This is the culmination of the initiative taken by the Commissioner of this Branch before and at the General Assembly of 1920 and since repeatedly urged upon the attention of the Canadian delegate on the Permanent Committee, Sir Thomas Elliott. The latter made a ready response and has already successfully used his influence with the Institute, in co-operation with the United States delegate, to the extent that the Bulletin of Agricultural Statistics now does use acres instead of hectares, and, in many cases, bushels instead of quintals, as well as dollars instead of francs. The United States' proposal is to make the use of the acre and bushel general in the Statistical Bulletin, the Statistical Year Book and other publications.

In proportion to the Government contributions to the League of Nations (some three or four million dollars) for the representation of some fifty countries, the paltry $175,000 at present being annually spent at the Institute for the representation of over sixty countries is quite insignificant and out of all proportion to the importance of the interests concerned. Hence this appeal to the friends

of this unversal agricultural league to subscribe to its publications. These are in their particular class really the most valuable agricultural periodicals published, either for scientific or for practical purposes.

In connection with this appeal it is recalled that the International Council of Agriculture held at Paris in May 1923 passed the following resolution concerning the International Institute of Agriculture: "Recognizing the services already rendered by this Institute the Governments ought to study the means by which its efficiency can be increased in order that agriculturists may in their turn derive the fullest benefit from its work."

This statement discloses an attitude similar to that of the Economic Council of the Great Powers at Geneva in 1922 which, in Article 20 of its resolutions, states: "It is equally desirable that the States give particular attention to the activities of the International Institute of Agriculture."

This common attitude of the highest international bodies in the world will without doubt rally to the Institute's support not only the Dominion and Provincial Governments of Canada, but also officers of agricultural bodies and individual agricultural readers, who may show their active interest by deriving the benefit accruing from keeping in touch with practically everything of importance going on in the outside agricultural world. If the League of Nations is worthy of the support of all Governments and the people behind them surely the International Institute of Agriculture, the harbinger of the Universal Peace Movement, through its founder, David Lubin, should consistently receive equally generous aid.

SCIENCE AND PRACTICE OF AGRICULTURE

AGRONOMY

332.—The Practical Measurement of Soil Acidity.—HISSINK, D. J., Dr., *De Veldbode*, No. 1066, pp. 475-476. Maastricht, June, 1923.

The author, who is the director of the Experiment Station of Groningen (Holland), has so far distributed to agriculturists 250 "Comber" instruments for measuring soil acidity. The figures obtained with this instrument are not absolutely accurate, but serve for practical purposes, indeed, the measurements made by agriculturists and tested by the author in his laboratory have in several cases proved to be quite exact.

The object of the author in thus distributing the "Comber" apparatus was to obtain a large amount of statistical material. He wished to learn the differences in the reaction of the soil of the same plot according as to whether the plants were growing vigorously or less strongly, since this would show the correlation existing between the degree of soil acidity and crop growth, as well as the amount of acidity required in the case of a given type of soil in order to insure the maximum development of any particular cultivated crop. It is also necessary in this connection, to take into account the situation of the fields, the fertilizer used, and the drainage.

The author gives an answer to the question put by many agriculturists who wished to know whether it was possible to determine by the Comber apparatus the amount of lime required for neutralizing acid soils. The quantity of lime to be applied to acid soils depends, not only upon the degree of their acidity, but is also influenced by the amount of clay and humic substances present. In order to obtain accurate data, the author advises that the soil samples should be analysed in the laboratory.

The Comber method has however, the advantage of enabling the agriculturist to know how many samples should be sent to the laboratory, which allows of the number being reduced and saves expenses

The author advises the regular testing of soil reaction, even after neutralization, for it is always possible that some of the lime, or of the chemical fercilizers, may have been removed by water, or that their action may only be evident after several years.

By means of the Comber method the agriculturist will always be able to decide for himself whether sulphate of ammonia is better for the soil than nitrate of soda and whether superphosphates or basic slag is the most suitable fertilizer in any given case.

The Comber method is described by the author in the *Journal of Agricultural Science* 1920, p. 420. About .5 cc. of a colourless solution of 40 gm. of sulphocyanide of potassium in a litre of 95 per cent alcohol are introduced into a test tube containing 2-3 gm. of soil. The test-tube is then corked and well shaken several times. As soon as the material in suspension has been deposited, the acidity is determined from the colour of the liquid.

Reaction	pH	Colour
Very acid..... ...	4-5	Dark red.
Acid	about 5	Red.
Slightly acid ...	5-6	Light-red.
Very slightly acid...	6-6-5	Pale pink, or colourless.
Traces of acid.......	6-5-7	
Neutral...........	7	Always colourless.
Alkaline........ .	above 7-6-5	

If the liquid remains colourless, some chloride of iron is added to colour the solution which is left for 18-24 hours and again shaken. If all the red colouration has disappeared, the soil will be about neutral ($pH = 7$); if, however, the red tint is still clearly visible, the reaction will be slightly acid. In order to estimate the alkalinity, a series of solutions coloured with increasing amounts of chloride of iron are prepared. The more alkaline the soil, the more iron chloride it is able to absorb.

335.—A Study of Certain Preservatives and their Effect on the Fertilizing Value of Manure.—COLLISON, R. C. and CONN, H. J., *Bulletin No.* 494, pp. 28-74, Geneva, N.Y., 1922.

The value of manure produced on the farm has increased to such an extent that every precaution should be taken to conserve the contained plant food material. The authors have carried out a large number of experiments in order to study the practical methods of treating manure so as to retain the plant food constituents. In the past, both mechanical and chemical methods have been recommended such as storing under cover and trampling down, or the addition of other materials, with a view to the prevention of loss of nitrogen caused by fermentation in the manure heap, or by leaching. Mechanical methods often necessitate extra labour and under ordinary conditions of farming it is usual to store manure for several months, hence, preservation by means of chemical agents assumes importance. An ideal chemical substance should prevent undesirable fermentative changes, but should not check the changes which break down the manurial compounds and make them available as plant food. If in addition, the added substance has a fertilizing value of its own, it is an advantage, provided that the cost is not too great. The authors experimented with the following materials: straw, peat, a clay-loam-soil, acid phosphate, rock phosphate and gypsum, and investigations were carried out with these materials under both laboratory and greenhouse conditions.

Allusion is made to the work of SEVERIN and of RUSSELL and RICHARDS and to the fact that the latter investigators found that the nitrogen losses were due to the volatilization of elementary nitrogen, rather than to that of ammonia. SEVERIN isolated organisms from manure and used them to inoculate sterilized manure. The authors searched particularly for the organism concerned chiefly with the volatilization of ammonia and succeeded in isolating an organism *Bacterium parvulum* which reduced nitrate to nitrite and causes the evolution of large quantities of ammonia from manure. The laboratory experiments showed that loss of ammonia from manure may be prevented by the use of acid phosphate, peat or gypsum; for instance the sterilized check lost only 3 mg. nitrogen as ammonia; the unsterilized manure gave off 247 mg.; when gypsum was added only 44.5 mg. were given off and with peat only 10 mg. or very slightly more than the sterilized check. In this experiment no attention was paid to the loss of free nitrogen. It was shown that preservatives have an effect upon the kinds of micro-organisms present and may suppress those which cause ammonia volatilization. The results obtained when straw was added to manure were interesting, as they suggest that nitrification may take place in manure.

Laboratory tests in themselves are insufficient, as the real test of a preservative is its ultimate effect on the fertilizing effect of the manure, and for this reason compost experiments in the greenhouse were carried out.

For the greenhouse work manure was mixed with the preservatives and kept in a fairly moist condition under cover for three months or more. The composts were then used as sources of nitrogen for crops grown in sand cultures and in the greenhouse, other food elements being supplied by the addition of a mineral nutrient solution. The plants were harvested when the various cultures had reached about the same degree of maturity.

The data relative to these cultures are given below:—

Dry Weight of Tops and Comparative Tillering in Barley Cultures in Compost Experiment No. 1, Culture Series No. 1

Source of Nitrogen	Culture number	Number of heads	Dry weight of tops
			grams
Rotted manure	1	10	5·0
Rotted manure + $NaNO_3$	2	26	60·5
Fresh manure	3	12	30·0
Fesh manure + $NaNO_3$	4	33	61·0
Gypsum compost	5	12	8·5
Gypsum compost + $NaNO_3$	6	22	58·5
Rotted manure + gypsum	7	11	5·5
Rotted manure + gypsum + $NaNO_3$	8	25	63·5
Acid phosphate compost	9	9	10·5
Acid phosphate compost + $NaNO_3$	10	27	64·5
Rotted manure + acid phosphate	11	10	10·5
Rotted manure + acid phosphate + $NaNO_3$	12	29	64·0
Rock phosphate compost	13	11	7·5
Rock phosphate compost + $NaNO_3$	14	26	61·0
Rotted manure + rock phosphate	15	11	6·0
Rotted manure + rock phosphate + $NaNO_3$	16	28	59·0
Peat compost	17	12	16·0
Peat compost + $NaNO_3$	18	34	69·5
Rotted manure + peat	19	11	8·5
Rotted manure + peat + $NaNO_3$	20	27	69·5
Straw compost	21	12	9·5
Straw compost + $NaNO_3$	22	33	62·5
Rotted manure + straw	23	8	2·5
Rotted manure + straw + $NaNO_3$	24	32	64·0
Soil compost	25	11	11·0
Soil compost + $NaNO_3$	26	19	36·5
Rotted manure + soil	27	12	7·0
Rotted manure + soil + $NaNO_3$	28	24	52·5

A second series of cultures were carried out in soil instead of sand, and a third series with composts, but containing four times the amount of compost used in Series 1 and 2.

Fresh manure gave a higher yield of barley dry tops than rotted manure or any compost, although the peat compost compared favourably. The addition of straw depressed the yield in every case except that of the manure-acid-phosphate-straw compost. When added to rotted manure the depression was 91 per cent and it reached 58 per cent in the manure-peat compost; further experiments are being made on this problem. In the vegetative experiments, acid phosphate compost gave the greatest weight of tops. Acid phosphate and peat both helped to retain inorganic nitrogen and apparently left the organic nitrogen in a condition more available to plants. The loss of dry matter on composts kept for four months ranged from 25 per cent on manure treated with acid phosphate to 63 per cent in untreated manure. Peat also was very efficient. Neither rock phosphate nor gypsum were satisfactory preservatives. The results of these experiments show that both acid phosphate and peat may be recommended as preservatives of manure. The former involves less labour, but peat has the additional advantage that it is an excellent absorptive of the liquid portion of the manure and in consequence acts both as a litter and a preservative.

168.—The Importance of Magnesium as a Fertilizer.—I. Popp, Prof. M. and Coutzen, Dr. J., Die Bedeutung einer Magnesiadüngung fur unsere Kukturpflanzen.—*Landwirtschaftliche Jahrbucher*, Vol. 58, No. 3, pp. 313-355. Berlin, March, 1923. II.—Garner, W. W., MacMurtrey, J. E., Bacon, C. W., and Moss, E. G., Sand Drown, a Chlorosis of Tobacco due to Magnesium Deficiency and the Relation of Sulphates and Chlorides of Potassium to the Disease.—*Journal* of Agricultural Research, Vol. XXIII, No. 1, pp. 27-41, bibliography. Washington, 1923.

Volcanic soils are mainly composed of silico-magnesian compounds. Magnesium is absolutely necessary to plants, for chlorophyll is an organic compound containing 2.7 per cent of magnesium (Wills-Tatter, Untersuchungen uber Chlorophyll. Berlin, 1913).

The author made some manurial experiments with magnesium from which he has drawn the following conclusions:

The application of magnesium salts in addition to different potassic salts, or of commercial postassic salts containing a certain amount of magnesium, does not materially increase the yield of different crops, although some good results have been obtained, but there were many cases of failure. Since the physiological reaction of the fertilizers is an important factor in crop yield, soil reaction must be taken into account as well as the reaction of the fertilizer. The potassic content of a plant depends upon the potassic fertilizer, but it is not,

however, possible to tell from the amount of potash present in the plant whether enough potassic fertilizer has been applied. Indeed, it sometimes happens that a crop which has failed owing to lack of potash in the fertilizer has a higher potash percentage than a crop dressed with a potassic fertilizer. This is especially true in the case of grass, but may also occur in that ot straw.

The magnesium content of crops has often been inaccurately determined; thus, for instance, STUTZERS well-known tables (in Mentzel's calendar) require revision. The amount of magnesium present in plants is little affected by a potassic fertilizer. The application of physiologically acid or alkaline magnesium salts has practically no effect on the magnesium content of the crop. Various plants use the magnesium of the soil to a different extent. Rye-grass assimilates most, then potatoes and tomatoes, and last of all rye, which assimilates very little of this element.

The solubility of the magnesian salts of mineral soils in a solution of ammonium chloride cannot be taken as any criterion of their assimilability by plants for the values obtained from the solution are far too high. The potash of the soil is probably taken up at the same time as the magnesium but larger amounts of the potash are utilized. The application of physiologically acid potassic salts has little effect upon the utilization of the soil magnesium; but physiologically alkaline salts may decrease it. Dressing with magnesian salts only influences the utilization of potassic salts in cases where physiological reaction comes into play. No direct action of the magnesium has yet been found. Salts of magnesium when added to a fertilizer are very little used by plants; the sole exception to this rule is in the case of the tomato, which bears a large number of leaves and absorbs considerable quantities of these compounds. The potato, on the other hand, utilizes a magnesium fertilizer to a very limited extent and therefore derives no benefit from it. The magnesium present in commercial potassic salts is not used differently. Neither the potato, nor any other plant, shows a preference for anv special potassium salts.

Since the amount of magnesium present in the soil is certainly sufficient for the crops grown, the application of magnesium salts seems superfluous.

The results of the author's experiments do not always agree with practical experience. Thus for instance, the beneficial effect on potatoes of the double sulphate of potassium and magnesium cannot be denied. It may, however, be supposed that the physiological reaction is of prime importance in this case. The problem can however be solved only by means of field experiments.

II. Magnesium appears to be of great importance in tobacco-growing.

Chloride of potassium tends to influence the burning properties of tobacco and sometimes produces an undesirable colour, therefore it is well to use sulphate of potassium in conjunction with sulphate of magnesium. Experience has proved that potassic salts such as kainit and other containing more or less magnesium, give better results than the pure sulphate. Very pure potassic salts ought not to be used for dressing tobacco. A total absence of magnesium produces tobacco chlorosis (sand drown). This disease can be cured, and even prevented, by adding small quantities of magnesium to the fertilizers employed. How far the experimental results obtained in the case of tobacco disease due to lack of magnesium can be applied to other crops is a matter still requiring study.

29.—Effect of Cupric Treatments on the Wheat Yield.—MORETTINI, A., *Le Stazioni sperimentali agrarie italiane*, Vol. LV, Pts. 7-8-9, pp. 265-277. Modena, 1922.

In a preceding article (*Stazioni sperimentali agrarie italiane*, (1921) the author has shown the advantage of substituting "polvere Caffaro" (oxychloride of copper), or powdered copper carbonate for the usual treatment with a solution of copper sulphate in the control of Smut (*Tilletia Tritici*). Experiments have proved that the dry treatment prevents smut without in any way injuring the germinating capacity of wheat. It has also been shown that germination after immersion in a 0.5 to 1.5 per cent solution of copper sulphate is not affected. This fact is confirmed by other investigators (KRAUSS, WOLLNY, KIDD and WEST); others consider it has an injurious effect (DARNELL-SMITH and ROSS; MACKIE and BRIGGS), and others again maintain that it is actually beneficial (HARRY).

Results in agreement with the author have been obtained by G. D'IPPOLITO (Riforma agraria) No. 6, 1920; (*Stazioni sperimentali agrarie italiane*, p. 293, 1921).

In the present case, the author proposed to investigate the effect of the two methods of treatment (with solution or with powder) upon the productivity of wheat, without any reference to their resistance to disease.

Three varieties. one an autumn wheat (Gentil rosso semiaristato 48), two spring wheats (one soft "marzuolo ferrarese", one hard "timilia di Sicilia") were each divided into five lots treated respectively as follows: (1) control; (2) immersed in water for 17 minutes, then allowed to dry in the air; (3) immersed in a 0.5 per cent solution of copper sulphate for 15 minutes, then for two minutes in milk of lime and allowed to dry; (4) mixed dry with 3‰ by weight of Caffaro powder; (5) mixed dry with 3‰ of copper carbonate.

The seed was sown 12 days after treatment. The growth was somewhat hindered by the dry spring.

The three series of results agree in showing a higher yield for the seed treated with powder as compared with untreated seed, or with water, or with a solution of copper sulphate. Of the fungicides employed, the copper carbonate gave the best results.

By means of germination tests made with seed subjected to different treatments, the author has ascertained that the increased yield following the dry treatment is due to an increase in the germination capacity. The difference between the germination capacity of the control seed and of that of the seed treated by dry process was, on an average, 2 to 3 per cent with copper carbonate and 2 per cent for "polvere Caffaro".

The increased yield in both cases appears to be due chiefly to the toxic action of the two copper compounds upon the moulds and bacteria that attack the germinating cariopsis and these compounds have no injurious effect on the embryo. This allows the grain to develop a higher germinative capacity; it is possible also that the copper may exercise a stimulative effect upon the growth of the seedling.

In conclusion the author recommends the use of powder fungicides rather than solution.

378.—Behaviour of Hubam Clover in Ohio.—WILLARD, C. J., *The Breeders Gazette*, Volume LXXXIII, No. 15, pp. 505-506. Chicago, April, 1923.

Results of two years observations, made with Hubam clover compared with sweet white biennial clover are summarized as follows:

Hubam in favourable seasons will give a larger yield of hay, following cereals, than any other clover. The yield was 3,930 lb. per acre following early oats, compared with 2,570 pounds of the biennial. As regards total growth, the biennial has proved superior: 240 pounds roots, and 2,730 pounds tops (Hubam) and 1,480 pounds roots and 2,090 pounds tops (biennial). As a soil improving crop, Hubam is therefore not recommended except where an annual crop is required. The nitrogen content of both roots and tops also compared unfavourably with the biennial. The weed problem is also a difficulty, but the value of Hubam clover in many situations where more expensive seed is impracticable, should not be overlooked. The value as a honey producer and the fact that it is possible to have a continuous production of bloom from late in May until after frost, by relying on biennial sweet clovers, and on Hubam is worth consideration.

Superior root yields have been reported in Iowa and indicate that under certain conditions, Hubam roots are equal in value to biennials.

207.—Winter Pruning Experiments with Apple Trees in England.—GRUBB, N. H., in the *Journal of the Royal Horticultural Society*, Vol. XLVII, Pts. 2 and 3, pp. 139-162, London, 1922.

An extensive series of experiments on the winter pruning of apple trees has been made at the East Malling Research Station, England, covering a period of nine years (1913-1922). The methods chosen for investigation were:

(1) unpruned; only diseased and broken wood removed;

(2) open centre; centre of tree kept more or less bowl shaped, no spurring otherwise;

(3) tipped and spurred; leaders tipped (strong growers one third; medium growers one half; weak growers two-thirds); and all laterals not needed to form branches, spurred to three prominent buds;

(4) tipped and short-spurred; laterals spurred to one prominent bud.

1. *Effect of tipping and spurring.*—Tipping appears always to delay or reduce blossoming at least until the biennial bearing habit reduces the number of blossom buds on untipped trees. The table showing the average number of buds per tree, unpruned and pruned gives ample evidence of this fact. The reverse is, however, the case as regards setting; in this case pruning has obviously an indirect influence on the number of mature fruits. The average of all the varieties under observations in 1921 showed that the proportion that set on pruned trees may be estimated as double that on unpruned.

Effect on Cropping.—Except in the case of two varieties, tipping has delayed cropping. In these two cases ("Newton Wonder" and "Beauty of Bath") the trees were tipped one-third. The value of long-spur pruned trees has been proved; in every case on an average of 3 years crops, the total weight of fruits has exceeded that from unpruned trees (about 30 per cent).

Effect on biennial bearing.—Tipping appears to check this habit, but a modification in pruning methods is required to reduce the amount of blossom during the full-bearing year as it seems that profuse blossoming has more influence than heavy fruiting in encouraging the alternate bearing habit. It is suggested that if trees could be hard pruned and the spurs drastically shortened in the winter following their "off" year, and merely thinned out or lightly pruned the alternate winter, cropping should in time become more uniform.

Effect on growth and ultimate size of the tree.—The tipped trees of several varieties show an increase in size of head, more rapidly than unpruned trees, but no general rule can yet be laid down.

Effect on susceptibility to certain diseases.—Tipped trees are much less affected by scab

(black spot), apple mildew, and common canker than unpruned trees. It remains yet to be seen whether this power of resistance should be attributed to a thicker cuticle or differences in structure of the tissues.

Effect of "Open centre" pruning.—The effects are similar to those of tipping but much less marked. The setting of the blossom appears to be more complete than on unpruned trees; the fruit is larger and slightly freer from scab but the cropping varies according to variety. It is interesting to note that the stock seems to considerably influence the total number of fruits. The difference between the open centre and unpruned trees as regards resistance to disease is at present only very slightly in favour of the open centre.

Effect of short-spur pruning.—This always tends to reduce blossoming at least up to the eighth year. In several cases however, setting has been more complete than on long-spur pruned trees and in a few cases has produced a larger total number of fruits. With some varieties (e.g. Cox's Orange and Lanes Prince Albert), the laterals die when short-spur pruned, leaving the wood bare. The Worcester Pearmain and James Grieve, are less seriously affected and Lord Derby and Gladstone show no trace of this effect.

Natural habit in relation to pruning.—It is essential to adapt methods of pruning to the habit of growth and fruiting of each variety; failure to do this often results in long-delayed cropping and heavy loss.

Apart from the erectness, such habits as stoutness of branches, spur formation and number of laterals formed have an equally important bearing on pruning methods.

In conclusion, the importance of studying the differences in the habit of varieties is emphasised, making allowances when pruning for differences in growth and other details.

379.—Sunflower Silage.—AMOS, A., and WOODMAN, H. E., *The Journal of Agricultural Research,* Vol. XIII, Part 2, pp. 163-168. London, April, 1923.

An account of trials with "Giant Ensilage", sunflower variety, grown for storage in the silo. This crop, planted on light gravel soil gave a yield of twenty tons of green matter per acre, containing 18.5 per cent dry matter, which compared favourably with the maize crop grown simultaneously (14 tons per acre).

After storage in the silo for three months the silage was examined and appeared to be of good quality, after removal of the top layer of waste material. An outstanding feature of the results was the extremely low percentage loss of dry matter which occurred, namely 4.8 per cent, appreciably lower than any of the corresponding figures obtained in the ensilage trials with oats and tares. The crude protein underwent very little change, but the digestibility value was somewhat lowered. Full data is given with reference to the composition and changes in content of dry matter of green sunflower and sunflower silage.

Trials made in the United States have already demonstrated its value as a stock feed and as a substitute for maize silage. An experiment to test the palatibility of this fodder was made at Cambridge. The authors consider, however, that further investigations as to digestibility and value as a cattle feed, and improved methods of cultivation in order to reduce the fibrous nature of the stems, are necessary before sunflower silage can be recommended on a large scale for feeding stock.

395.—PERCIVAL, Prof. J. Seed mixtures for permanent Grassland. *Journal of the Ministry of Agriculture,* Vol. XXX, No. 3, pp. 204-209. London, 1923.

Comparison between the chief methods commonly employed for the production of permanent grass on arable soils: (1) tumble down pastures (random herbage); (2) sowing of hay seeds (from barns and haystacks, etc.); (3) use of seed mixtures of commercial grass and clover seeds. The advantages of a complex mixture are discussed and a list of useful mixtures on light, medium and heavy soils is given including details as to preparation of the land and sowing.

LIVE STOCK AND BREEDING

248.—Karakul Sheep Breeding in the United States.—YOUNG, C. C., Practical tests in Karakul sheep breeding. *The Journal of Heredity,* Vol. XIII, No. 5, pp. 228-236, Washington, 1922.

The Karakul sheep can raise its head to the same level as a cow, and is thus able to reach the fruit of many kinds of shrubs and weeds. It has very strong teeth and the mucous membrane of the mouth is very rough.

A test made for a period of several months at El Paso (Texas) shows that the Karakul sheep fattens as rapidly on a poor, dry pasture as a merino fed on lucerne and maize.

On March 20, 1920, four rams were tested on behalf of the United States Bureau of Forestry, being allowed to feed naturally by nibbling the bark of oak trees, willows, "manzanitos", etc. and browsing on poor grass. On May 11, 1920 the rams were shorn and weighed, and weighed a second time at the end of August with the following results:—

—	May 11, 1920		August 31, 1920	
	Weight of fleece	Weight of shorn ram	Weight of ram	Gain
	lb.	lb.	lb.	lb.
No. 1...	10	147	213	66
No. 2...	8	141	178	37
No. 3....	10·5	130	172	42
No. 4........	11	101	141	40

The fleece shorn on May 11, 1920 was 6 months old and the wool contained no grease and did not require washing, which in the case of the merino causes the wool to lose 50 per cent of its weight.

The flesh of the Karakul has a different flavour from that usually characteristic of sheep and resembles venison. In Central Asia the fat takes the place of butter and is used for cooking purposes.

Crossing a thick fleeced domestic ewe with a good type of Karakul ram often produces lambs whose fleeces are as valuable as those coming from pure-bred sheep. The writer has ascertained that in practice such crossing gives about 100 per cent of black and very early fleeced lambs. The ewes that are more suitable for crossing belong to the following breeds: "Najoo", black headed "Highlands", "Hairy Mexican Corrientes", "Cotswolds", "Lincolns" and "Ahuris".

Since pure-bred specimens are now rare and those only which have never been crossed with a fine wool stock and are of sufficiently pure Danador origin can reproduce lambs with glossy, black and curly fleeces, the writer is of opinion that those only should be considered as pure-bred whose offspring have actually given proof of such purity.

The author considers that the breeding of Karakul sheep can only be expected to be successful if exchanges are made of the comparatively few bred rams and the fine wool specimens are eliminated. He also calls attention to the publication in November, 1922, of a monthly review "*The Karakul Breeder*" specially devoted to this subject

402.—The Value and Use of Certain Stock Feeds.—I. KLING, H. *Wein und Rebe*, Year, 4, Part, 7, pp. 311-326. Mainz, 1922.

II. Fish meal as a food for livestock *Ministry of Agriculture and Fisheries*, Leaflet, No. 333 (Revised, November, 1922). London.

III. PFEIFFER TH.—*Fuhlings Landwirtschaftliche Zeitung*, Year 71, Parts 17-18, pp. 313-324. Stuttgart, 1922.

IV. RICHARSEN and BRINKMANN, *Ibidem*, pp. 325-334.

V. ENGELS. *Suddeutsche Landwirstchaftliche Tierzucht*, Year 17, No. 25, pp. 299-303. Hanover, 1922.

VI. FRAPS, G. S. Digestibility of the Sugars, Starches, Pentosans and Protein of some feeding stuffs. *Ibidem*, No. 290, 21 pp. 1922.

VII. FRAPS, G. S. Digestion Experiments. *Ibidem*, No. 291, 11 pp. 1922.

VIII. WHEELER, G. B., The Marketing of Mill Feeds. *Ibidem*, No. 1124, 1922.

Nos. II and VIII are reprinted as follows:—

II.—*Experiments carried out in Great Britain in order to determine the value of fish meal as a food for live-stock.*—The annual production of fish-meal in Great Britain exceeds the internal consumption. Most of this meal used to be given to poultry, but of recent years, it has been increasingly fed to other domestic animals.

The general average of nine recent analyses has given the following minimum, maximum and mean percentages: moisture, 7·7 to 18·1; 12·9; albuminoids (proteins): 51·1 to 63·1; 56·6;—fat 1·3 to 6·7: 3·71 mineral constituents 20·8 to 28·0; 24·9 (these figures include: calcium phosphate 16·6 to 20·6; mean 18·8—salt 0·6 to 5·3; mean 2·2) carbo-hydrates, crude fibre, etc., 0·3 to 4·2; mean 1·9.

As a general rule, fish-meal should only form one eighth of the ration, and when employed as a stock feed, ought to contain no herring, debris or salt. If these precautions are observed, the meat of pigs given fish meal is of excellent quality, but if this care is not taken, the pork acquires an unpleasant smell.

No detrimental affect on the appearance, odour, colour and culinary value was observed in the case of the meat of the pigs used in experiments at Leeds University, where fish-meal formed 1/9 to 1/7 of the total dry food, being fed during the last month at the rate of over 0·5 kg. per head and per day.

In the pig-feeding experiments conducted at the Rowett Research Institute of Bucksburn, Aberdeen, tests were made with:

(1) Fish-meal especially prepared for a stock-feed from fresh salmon waste (analysis: albuminoids 61·1; fat 2·3; inorganic matter, 25·0; moisture 10·3; undetermined 1·3 per cent).

Results.—No disagreeable smell, or taste, was imparted to the fresh, or salted meat, even when the pigs had been fed the meal up to the time of killing.

(2) Fish-meal made of a mixture of salmon and herring waste (analysis: abuminoids 62·2; fat 6·4; inorganic natter 13·6; moisture, 14·6; undetermined, 3·2 per cent). Proportion fed 1/7 of the ration.

Results.—The meat of these animals had a disagreeable smell and taste.

(3) Various commercial fish-meals sold under the name of "White Fish Meal"; amount fed 1/8 of the ration.

Results: no unpleasant odour or smell was imparted to the fresh meat, even when the pigs were fed this meal up to the time of killing. The salted meat, however, had an unpleasant flavour in the case of animals that had received fish-meal up to less than 14 days before they were killed. If the fish-meal had been discontinued for 14 or more days before the animals were killed, their meat was not affected. It may therefore be concluded that meal made from salmon refuse may be fed up to the time of killing in the case of animals of which the meat is to be consumed fresh, and up to three or four weeks before the time of killing, if the meat is intended for salting.

Fish-meal 1 and 2 were given to dairy cows (0·9 kg. per head and per day for two months), and also to hens: the milk from the cows, and the flesh and eggs of the fowls were not affected in any way.

The fish-meal manufacturers of Great Britain have agreed to produce a meal made only from salmon refuse to be sold under the name of "White Fish Meal" and having the following composition: albuminoids not below 55 per cent; calcium phosphate not below 16 per cent fat not above 5 per cent, salt not above 4 per cent.

In three experiments made in 1918-1920 at the West of Scotland Agricultural College, fish meal of the above given type was used for fattening cattle at the rate of 600 gm. per head and per day mixed with rolled oats. The animals fattened well and their beef was excellent. Up to 1·4 kg. of fish meal per head and per day, may safely be fed to milch cows, but care must be taken that the milker does not touch the meal just before milking, otherwise the milk acquires a disagreeable smell.

Owing to its high albuminoid and phosphate content, fish meal is especially good for calves. Recent experiments have proved the advantage of rearing calves on whey and a mixture of fish meal and meal, or milling offals; one part of fish meal and two parts oat meal or middlings being given, for instance. In some trials made at Reading, the following mixtures were given at the rate of 500 gm. per 5 litres of whey: linseed cake + bean flour + fish meal (3:3:1); (2) linseed cake + fish meal (2:1) (3) linseed cake + oat chaff + fish meal (3:2:1).

Horses may be given up to 0·9 kg. fish meal per head and per day; fish meal is especially useful when good hay is lacking and much straw has to be introduced into the ration.

Fish meal also forms a very supplementary food for sheep on roots, and can be given to them at the rate of 150 to 200 gm. per head per day, and per 100 kg. of live weight. It is well suited to suckling ewes.

Chicks must not be fed fish meal until they are at least a week old, when this meal may form 5 per cent of the mash, the amount being afterwards increased gradually. Young fowls, can be fed the following ration: crushed oats + chaff + maize flour + fish meal (8 : 8 : 2 : 1). Laying hens may be given 10 to 15 per cent of fish meal in their mash which may be composed, for instance, of middlings maize flour + chopped lucerne or clover, hay + fish meal (3 : 3: 3 : 1).

VIII. *The marketing of mill feeds.*—The author, Investigator in Feed Marketing, Bureau of Agricultural Economics, Office of Rural Economy of the Department of Agriculture of the United States, examines the organization (from the mills to the purchasers) of the complicated trade of the by-products of milling in the United States, whether this organization is the work of dealers or of wholesale, or retail, buyers or of purchasing co-operatives. He treats of the commercial laws regulating this trade, the grades of the various feeds, the method of studying the condition of the market and of ascertaining the quoted prices, the laws governing this trade in the United States and the present needs of the trade.

Purchasing co-operatives, when first started, preferred to buy their goods as soon as they arrived, viz. after they had been inspected, rather than from the millers who insisted upon payment on delivery or before the goods had reached their destination. Now, however, that the millers are willing to make good any reasonable claim arising from the quality of the commodities received, they always prefer to buy from the millers direct.

The average difference between the sale price asked by the miller and the retail seller respectively amounts to about $10 per ton, not including carriage, which is not excessive allowing for the expense of storing.

A car-load is twenty tons net. The Official Association of Feed Control in the United States recognizes the following classes of feeds, which unless special arrangements are made to the contrary, are generally recognized and accepted by the trade: Wheat bran—standard millings—red dog flour, a mixture of low grade flour and fine bran—wheat mixed feed (a mixture of bran and standard middlings in the proportions obtained by ordinary milling)—wheat bran and standard middlings (a mixture of the two latter in the proportions obtained by ordinary milling)—screenings—scourings.

414.—A Study on the Pasteurization of Colostrum.—Ragsdale, A. C. & Brody, S. *Journal of Dairy Science*, Vol. VI, No. 2, pp. 137-155. Bibliography. Baltimore, 1923.

Colostrum plays a very important part in the regimen of the calf by reason of the globulin and the defensive bodies which it contains, such bodies being absent in the early days of the life of the calves. It is

therefore necessary that these bodies and the globulin should be left intact when the colostrum of a tuberculous cow is to be disinfected. Disinfection can be carried out by means of pasteurization by placing the vessel containing the colostrum in a bath and warming by steam heating.

Care must, however, be taken to avoid the coagulation of the colostrum while heating for the purpose of sterilizing the tubercle bacilli. The following shows the time required at different temperatures for obtaining these two results.

Temperature Degrees F.	Time required to inactivate the organism of tuberculosis in milk	Time required to thicken colostrum so that it barely flows
	minutes	
140·0..	20·0	3 hours.
144·5	18·5	30–40 minutes.
149·0..	14·0	10–15 "
153·5.	7·5	4– 5 "
158·0 .	3·0	2 "
162·5 .		70–75 seconds.
167·0..		45–50 "

These figures have an approximate value only and vary with the composition of the colostrum, but they show that colostrum may be safely pastuerized at 140°F.

In the experiment, calves that received pasteurized colostrum showed a mortality of 6 per cent, while for those that were fed a raw normal milk the mortality was at the rate of 32 per cent.

The figures amply justify the pasteurization of the colostrum and show that the process does not materially affect the protein or the protective bodies. Laboratory experiments have also proved that by heating to a temperature of 149° F, the value of the amboceptor or protective body is not diminished.

Further experiments are to be made with regard to the effect of heat on these protective bodies.

419.—The Necessity of Calcium and Phosphorus in the Diet of Dairy Cows.— MEIGS, E. B., *Journal of Dairy Science*, Vol. VI, No. 1, pp. 46-53. Bibliography, Baltimore, 1923.

The author after reference to the work of FORBES and HART, sums up the evidence so far presented by stating that it appears that liberally milking cows are usually able to maintain themselves in calcium and phosphorus equilibrium when they receive an abundance of good lucerne hay, combined with concentrated goods, rich in phosphorus.

The Department of Agriculture of the U.S.A. is at present making an experimental test to establish the value of coarse foods with a low calcium content which are fed instead of lucerne. To one group of cows is given a mixture of grains high in protein and timothy hay only, or timothy hay and silaged maize; another group received the same rations with calcium carbonate added, or a ration containing the same or approximately the same protein content but with lucerne hay, instead of timothy. These experiments have not yet been completed, but the results obtained, show that sooner or later the yield of milk from cows who receive forage with a low calcium content, is greatly diminished and that this decrease is mostly due to the calcium deficiency.

On the other hand it appears that the liberally milking stall-fed cows can be kept in calcium equilibrium only if fed on large quantities of forage with a high calcium content as for example, lucerne hay.

Since the experiments of FINGERLING and HART, many others have been made, and seem to indicate that the assimilation of calcium and phosphorus is influenced by vitamines. Dairy cows on pasture can maintain calcium equilibrium on a smaller absolute calcium intake than those on dried materials with or without maize silage.

FORBES reported that in the case of cows that were dry or giving only small amounts of milk, the calcium and phosphorus balances were both usually positive. The cows used in these experiments, however, received lucerne hay.

Some tests were made by the Department of Agriculture of U.S.A. to determine what influence the substitution of timothy hay for lucerne had on cows giving small amounts of milk. Cows on timothy hay have continued to give a small amount of milk for many months consecutively, but these cows were being fed on rations which contained much more protein and nutritive matter than they required according to any of the feeding standards.

It is likely, therefore, that the results indicated only confirm the theory that cows giving small amounts of milk can eat much more food than they require, and compensate in that way for the absence of a particular substance in the rations given to them.

It is perhaps not too strong a statement that it is always bad practice not to include liberal quantities of leguminous hay in the rations of dairy cows which are receiving only dry seeds and silage.

The dairy farmer must not expect to obtain a large yield of milk in winter if he cannot give his cows lucerne and other leguminous hay in large quantities. It will probably pay him to see that each of his cows has a dry period of two months and that during this period she receives twice the maintenance ration in protein and total nutrients.

The author also states that so far experimental work has not been sufficiently advanced

to demonstrate whether lucerne hay can be replaced by other leguminous hays to provide a source of calcium, or how the calcium requirements of cows on different kinds of pastures can be supplied.

71.—Food Value of Coconut Cakes, Coconut Meal and Ground Linseed for Dairying.— HANSON, N., *Landbruks-Akademiens, Handlingar och Tidskrift*, No. 6, pp. 497-519, Stockholm, 1922.

During the winter months of 1921-1922 the Department for Feeding Research of the Swedish Agricultural Experiment Station has carried out feeding experiments in order to ascertain the food value of coconut cakes, coconut meal (extracted) and ground linseed for dairy cows. The feeding experiments with the coconut foods have been carried out as group trials with 42 cows on two farms. In these experiments a daily ration per cow of 3·3 pounds of coconut cakes or of 3·3 pounds of coconut meal was replaced by a ration of 4 pounds of wheat bran and one third of a pound of peanut cakes. With linseed only one trial (carried out as a period trial) has been made. In this experiment a ration of 2·2 pounds of wheat bran was given. The results obtained in these experiments can be summed up as follows:—

(1) That coconut cakes and coconut meal are excellent foods for dairy cows with a favourable effect on milk production and in dietetic respects.

(2) That coconut cakes as well as coconut meal increase the percentage of fat in milk.

(3) That this effect is dependent partly on the percentage of fat in the food mentioned so that cakes containing 7-8 per cent of fat, on the whole, increase the percentage of butter fat in milk more than meal containing only 3-4 per cent of fat.

(4) That this effect of coconut foods furthermore is dependent on the amount of the coconut foods given daily, the length of the periods of the trials and the other foods given at the same time.

(5) That the capability of the coconut foods to increase the percentage of butter fat in the milk is so general that of 30 cows, which have been given this food in these experiments, 28 have reacted in the same direction, while it was found that one of the two other cows was suffering from an abnormal state of health.

(6) That if consideration is given to the effect of the coconut foods both as regards the quantity of milk and the production of fat, about 1·9 pound coconut cakes of the composition proved here ought to be considered equal to one food unit.

(7) That under the same conditions about 2 pounds of coconut meal with 3-3·5 per cent of fat is required to equal one food unit.

(8) That ground linseed given to dairy cows considerably increased both the percentage of fat in the milk and the total butter fat production.

(9) That one pound of linseed of normal composition seems to have about the same nutritive value as 1 pound of ground oats plus 1 pound of wheat bran.

(10) That ground linseed is well liked by the cows, has a good dietetical effect on the animals as well as a favourable influence on their coat of hair.

258.—The use of Germinated Oats and Barley as a Feed for Laying Hens.—LEGENDRE, G., *La Revue Avicole*, Year 33, No. 2, pp. 57-59. Paris, 1923.

Green food is a necessity in winter if fowls are to keep their health. It can be fed, however, in the form of germinated seeds, especially oats and barley; in this manner the poultry obtain at the same time all the benefits of a grain ration. Oats are generally employed for this purpose.

A germinating apparatus is very easily made, for it consists essentially of a stand upon which several lattice work trays can be placed one above another like drawers. Four deal uprights 1½ or 2 inches broad and from 6 to 7 feet long are placed at each corner and firmly fixed. Every 12 inches up these verticals are placed horizontal bars of 1 x 2 inches upon which the trays slide. The latter are 2 feet wide and 2 inches deep, their sides are made of boards about 1 x 2 inches and at the bottom are strips of wood ½ inch in width, placed at intervals of ⅛ inch and securely fixed to the frame. These trays which are exposed to the continual moisture of the germinating oats must be of hard planed wood, although the frame can be of deal.

One and a half gallons of oats of good quality are placed in a sieve and over them are poured one and a half gallons of tepid water, the temperature of which should be a little under 100° F.

In order to prevent the growth of moulds, a small teaspoonful of formalin should be added. After 48 hours as a maximum, the oats can be spread on the lower tray of the stand described above. The layer of seed ought not be more than 1 inch thick in order to avoid any injurious rise in the temperature. Then the whole apparatus must be placed near the window of a well ventilated room having a temperature of 60° to 68° F.

The oats are well sprinkled twice a day with water at the room temperature. The day after it has been placed in the stand, the first tray is moved to the second shelf, and another put in its place. Each tray thus moves up a shelf higher every day. Until the seedlings have reached the length of ½ inch the oats should once a day be moved about to allow the seed to germinate readily. After the seedlings have attained this

size, it would be disadvantageous to disturb them.

By the time the tray reaches the top shelf, all the seedlings ought to be 4 to 5 inches long and may then be fed to the hens. If they are allowed to grow beyond 6 inches the food supply of the seed is exhausted.

In a heated germinator, the number of shelves may be reduced to 4 and the oats can be given to the poultry on the fifth day (one day of soaking and 4 of germination).

Two and one-fifth pounds of oats give about eight pounds of germinated grain. With the 24 pound of germinated oats that can be obtained every day from trays of the size described, the ration of 500 fowls can be supplemented, as they must not be fed more than ⅜ of an ounce of oats per head per day. A larger amount might cause diarrhoea, while if as much as 1½ ounces are given this feed is actually dangerous to the birds.

The apparatus must be disinfected after use; the author recommends for the purpose a 5 per cent solution of formalin, which effectually prevents any growth of moulds on the trays.

Barley when treated in this manner absorbs the same amount of water, but takes longer during the process.

431.—**Foul Brood.** *Ministry of Agriculture and Fisheries*, Leaflet No. 32, 6 pp. London, 1923.

There are three varieties of foul brood: the virulent form with strong smell due to *Bacillus alvei*, the odourless type caused by *B. Burri*, *B. Brandenburgiensis* and *B. larvae*, and the foul brood of which the pathogenic agents are *B. Guntheri* and *Streptococcus apis*. The latter often accompanies virulent foul brood and does not form spores. The bacilli can be seen at the beginning of the disease, but when it has reached an advanced stage, they form spores and disappear. The spores are resistant to freezing, carbolic acid, thymol, salicylic acid, napthol B, perchloride of mercury, creoline, lysol, oil of eucalyptus and napthaline. The last 4 substances, which become volatile at the ordinary temperature of the beehive, hinder the growth of the bacilli, but have no effect upon the spores which can be placed for two months in a solution containing 5 per cent of carbolic acid, or immersed for 15 minutes in boiling water without any injury. The disease must therefore be controlled during its early stages. For the prevention and cure of foul brood, the author recommends the following measures:

(1) When the bee-keeper has been in contact with an infected colony, he should wash his hands and disinfect his implements with carbolic soap or with a solution of carbolic acid (Calvert's No. 5), mixed with 12 times its weight of water. Before washing his hands or implements, he ought to remove by means of a little alcohol (pure or denatured) all the infected matter that is insoluble in water.

(2) If a weak colony is infected, it is best to destroy the bees, combs, frames and covers and to disinfect the hive. The bees can be killed by pouring a saturated solution of potassium cyanide into the brood-nest, care being taken to previously close any apertures by which the gas can escape. Another method is to suffocate the bees by passing sulphur fumes into the brood-nest. The dead bees, together with the combs and covers ought to be buried to avoid infection. The operation is best carried out at night when the bees stop flying. It is necessary to disinfect the hive also, this may be done by flaming the inside with a soldering lamp or covering the internal walls with paraffin or petrol and setting fire to these substances.

(3) If the disease breaks out in a strong colony, the bees can be saved by making them swarm artificially into a box or basket, and shutting down the lid. Care must be taken to insure their having sufficient air. The colony is then put in a cool place for 48 hours and fed; after this interval the bees are put into a hive with moveable frames and treated like a swarm being given syrup mixed with napthol B and kept moderately warm. Any of the insects that die during the treatment should at once be burnt.

When the disease occurs in a light form, fumigation or disinfection is sufficient; this may be effected by suspending from the division-wall a sponge or piece of flannel soaked once every six days in 40 gm. of formalin, 2 balls of napthaline being left during this time in the brood-nest.

435.—**Renewal of the Combs in Bee Hives.**—Ayme, H., *Journal d'agriculture Pratique*, Year 87, Vol. I, No. 2, pp. 32-34. Paris, 1923.

The author has noticed that when bees instinctively realise the necessity of renewing their combs, this knowledge often comes to them rather late, and that man can supply their needs in this respect in a more timely and satisfactory manner. Experience has proved that when a colony does not thrive, in spite of having been provided with plenty of food and with a young queen, this is to be attributed in nine cases out of ten to the hive being too old, or having been accidentally deprived of its queen, with the result that the central combs serving as brood-combs are in a bad condition. The remedy consists in the removal of all old frames containing neither brood nor honey, and their renewal by new frames. If the old ones

70305—7

contain some honey they can be placed at the ends, but as soon as the brood has hatched out, such defective frames should be entirely discarded. By the adoption of this system, two years are amply sufficient for the complete renewal of the brood-combs in a hive with 12 to 14 large frames. The use of corrugated wax greatly facilitates the operation which, in the opinion of the author, should be carried out every 6 years, though in order to disturb the bees as little as possible, it is well to renew two or three combs every year instead of substituting 5 or 6 new ones at a time.

The deterioration of the combs is due: (1) the cavities of the cells become reduced in size owing to accumulation of the outer silky coverings left behind by the chrysalides; (2) the bees, or some of their enemies gnawing the cells; (3) the excess pollen deposited by the bees upon the combs surrounding the brood-comb. This pollen decomposes in time and is the chief cause of the necessity of renewing the combs. The combs can, however be cleaned by washing, they are left to soak for twenty-four hours in tepid water, after which a small jet of water is directed upon each comb in turn. If the operation is not successful, it is necessary to scrape away the cells with a knife until the corrguated wax is exposed, when the bees will construct new cells upon it in the same manner as they do upon new corrguated wax.

129.—The Copper Content of Cow's Milk.—Supplee, G. G., and Bellis, B., *Journal of Dairy Science*, Vol. V, No. 5, pp. 455-467. Baltimore, 1922.

Many records are available which prove the presence of copper in animal and vegetable susbstances but the references to the copper in cow's milk are rare. The author proposes therefore to furnish data showing the variation in copper content of cow's milk, freshly drawn, and after being in contact with metallic copper,—a likely occurrence in milk establishments. The data is the result of 2 years work in connection with research on dessicated milk products.

Copper was found to be a normal constituent of freshly drawn cow's milk. The amounts found in milk of individual animals varied from 0·3 to 0·8 mgm. per litre. The average amount found in 23 of such samples was 0·52 mgm. per litre. Apparently neither feeding on pasture nor in the stall has any effect on the copper content of milk.

The amount of copper in milk may be considerably increased by storing and heating in a copper utensil. Slight increases in the copper content may also result from the passage of milk through copper pipes from which the tin has been worn off. Copper from this source, however, is less than that from the formation of copper compounds round brass or bronze fittings as a consequence of inadequate sanitary arrangements.

The significance of minute amounts of copper in plant and animal tissues is so far unknown. Its presence in milk particularly when taken up as extraneous contamination, may prove to be significant in connection with the high susceptibility of the antiscorbutic vitamine to oxidation. In fact, the destruction of this vitamine by acceleration of oxidation as a result of pasteurizing milk in a copper vessel has already been reported.

IMPLEMENTS AND MACHINERY

281.—System of Protection of Tractors Against Frost.—*The Implement and Machinery Review*, Vol. 48, No. 571, p. 891. London, 1922.

Serious accidents, such as the cracking of the radiators and the cylinder covers, have been caused by the freezing of the cooling water, with consequent expensive repairs and throwing the machine out of work, for some time. Undoubtedly the simplest way to prevent such accidents would be to empty the radiator whenever there is danger of frost; this remedy, however, is dependent on the human factor and forgetfulness may prove costly.

Another expedient is to lower the freezing point of the cooling water by means of mixing with it glycerine, methylated spirit and chloride of lime.

These remedies also have drawbacks because glyercine soils the tubes of the radiator and the pump, and decreases the power of cooling: methylated spirit evaporates gradually at 80°C. and chloride of lime alone gives good results.

The problem has now been solved mechanically by a French engineer who has invented an apparatus by means of which the radiator is emptied automatically before the water is transformed into ice. A small apparatus formed of a copper worm and a chamber closed below by a valve, communicates with the lowest point of the radiator. When the temperature of the air falls, the water in the worm, owing to its small volume and the high conductivity of the copper, cools more rapidly than that in the radiator, consequently the water in the worm is transformed into ice while that in the radiator is still liquid. The increased volume of the mass of water owing to its transformation into ice, causes a piston to advance which operates the opening of the valve and consequently the emptying of the water in the radiator.

Experiments have shown that the apparatus works when the water in the radiator is still at 37·4° F and that all the water can be emptied before transformation into ice occurs.

473.—The Importance of the Type of Feed-water for Boilers in Dairies.—A. F. *Molkerei-Zeitung*, Year 37, No. 1, pp. 1-2. Hildesheim, 1923.

In every case, care must be exercised that the boiler is not rapidly destroyed by the water supplying it.

River water contains a larger or smaller percentage of mechanically transported material, after filtration the water is excellent for supplying boilers, since it contains few substances in solution, or at all events, many less than are present in subterranean water.

While the substances mechanically mixed with water are comparatively easily removed, it is much more difficult to get rid of those in solution.

The most imporant salts forming such deposits are:—Magnesium carbonate; calcium carbonate; magnesium sulphate; calcium sulphate.

Different waters vary greatly as to the presence and amount of these salts to which their hardness is due; I degree of hardness (German scale) corresponds to I gm. of calcium and 0·7 gm. magnesium in 100 litres of water.

The size of the boiler is a very important factor in determining the water that can be used; for a boiler of large capacity, the feed-water may have 10 degrees of hardness, but if the boiler is small the water must be softened, even if its hardness is only 6-7 degrees. The calcium carbonate and magnesium carbonate separate out during the process of boiling and form a deposit. Temporary hardness can be removed by heating the water to 80°-100° C. and adding at the same time some caustic lime, or caustic soda; 1 kg. of calcium must be added per 1,000 litres of water.

Sulphate of lime and sulphate of magnesium can be removed as a deposit by boiling the water and adding some calcined soda in the proportion of 1·9 gm. to every 100 litres of water to be softened. Care should however be taken not to introduce too large a quantity as this immediately induces the formation of froth. It is very advisable to add a soda solution until a faint blue coloration is produced on litmus paper. The litmus paper test should be applied every day.

Water from condensation of steam is also very suitable, as its heat can be utilized again and it is free from all-deposit-forming, or encrusting matter. Care must however be taken so that it does not contain any oil, which is very injurious to boilers; as a precaution, this water should be passed through a Koks filter, or through wood wool.

AGRICULTURAL INDUSTRIES

486.—Injurious Action of Light on Butter.—LAUTERWALD, F., *Molkereizeitung*, Year 37, No. 17, p. 309. Hildesheim, 1923.

Basing his remarks on personal experience in the capacity of "Molkerei instruktor" (Instructor of the Dairy and Dairy Products Industry), the author lays stress on the strong action of light upon butter which is far more injurious than is stated by treatises on the subject, or believed by practical dairymen. Ten minutes exposure to brilliant sunshine is enough to give a sebaceous appearance and flavour to the finest sample of butter. He therefore advises the following technique:—the butter must be worked as soon as it comes from the churn, salted, made up, and at once taken into the dairy (which must be dark, damp and well ventilated); there it should be left to drip until the next day, again made up, put into barrels and the covers put on. The windows of the butter dairy must be red, yellow or grey. The custom of exposing butter for sale in the shop-window should be abandoned, even if it is covered over to keep it dark. Also in the house, the butter should be kept in yellow, red or grey glass vessels and never in green, blue or colourless receptacles.

489.—Honey and Atmospheric Moisture.—Waters, R., *The New Zealand Journal of Agriculture*, Vol. XXVI, No. 2, pp. 106-107. Wellington, 1923.

From the results of laboratory experiments the author concludes that in a dry atmosphere, the water content of honey rises with its increase in specific gravity whereas a lower specific gravity allows the water to escape more easily. On the other hand, when the atmosphere is saturated with moisture, honey with a higher specific gravity is able to absorb relatively more water in a given time than honey with a low specific gravity. In a saturated atmosphere, the samples used by the author were able to absorb water much more rapidly than they could yield it up in a dry atmosphere.

The author found on exposing honey to natural atmospheric conditions, but protecting it from the sun, that it slowly reaches a stage of equilibrium as regards gain and loss of water, after which its moisture content varies with the changes in atmospheric moisture but in a lesser degree. These variations would, however, seem to be more perceptible as the temperature of the atmosphere rises.

By exposing the honey to the air only during the hours of sunshine, the author proved that the quality of honey depends

70305—7½

upon temperature. In fact, at a temperature of 10° C. to 15° C. the specific gravity of a good honey decreased by 0·001 in 2 or 3 days whereas when the temperature is from 15° to 26° C., the specific gravity of a honey of poor quality increases 0·001 every 8 or 9 hours.

PLANT DISEASES

510.—Apple Canker (Nectria Galligena) Infection through Scab Wounds.—WILTSHIRE, S. P., *Annals of Applied Biology*, Vol. IX, Nos. 3-4, pp. 275-281, tables I. London, 1922.

The author has referred in a previous paper to the fact that the canker fungus (*Nectria galligena* Bres) can enter the apple tree through wounds casued by scab fungus *Venturia Inaequalis*, and in this article describes this process in detail.

The scab fungus infects the shoots of apple trees during the autumn following their growth; in the spring most of the pustules are surrounded by a cork layer and are subsequently completely separated from the tree, the only trace of infection being a slight roughness of the bark, which facilitates the entry of the canker. If the tree is sufficiently vigorous to form a cork layer round such a scar before the wood has become infected, the canker makes very little progress otherwise the fungus develops in the normal way.

A microscopic examination reveals the presence of two mycelia somewhat difficult to distinguish between, but generally speaking that of the scab fungus appears dark and inclined to be thick walled, whilst that of the *Nectria* fungus is hyaline and thinner.

The penetration of *Nectria galligena* into the cortex is described in detail. During the summer the progress is slow, as was confirmed by observations.

As regards control measures, it seems that it is not only a question of protection of fruits, but also of the bark injured by the scab *Venturia*. Winter spraying, immediately after defoliation has proved effective.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

An Inquiry into the Question of Saving a Part of the Phosphatic Fertilizers in Germany.—AEROBOE, F., in *International Review of the Science and Practice of Agriculture*, April-June, 1923, pp. 298 304.

Leucite in Agriculture.—D'OSSAT, G. de A., in *International Review of the Science and Practice of Agriculture*, April-June, 1923, pp. 305-316.

The European Seed Testing Association.—DORPH-PETERSEN, K., in *International Review of the Science and Practice of Agriculture*, April-June, 1923, pp. 317-321.

161.—Weather and Crop Yield.—WARREN SMITH J., *Monthly Weather Review*, No. 50, Part II, pp. 567-572. Washington, 1922.

162.—The Resistance Shown by Numerous Varieties of Wheat at Svalof During the Winter, 1921-1922. AKERMAN, A., 1922. *Sveriges Utsadesforenings Tidskrift*, Year XXXII, Part 5, pp. 252-260. 1922.

175.—Characteristics of Wheat of Bihar and Orissa (India) and Comparative Rust Resistance—HOWARD, A., HOWARD, G. L. C. and KHAN, A. R., *Memoirs of the Department of Agriculture in India, Botanic Series*, Vol. XII, No. 1, pp. 1-20. Calcutta,—London, 1922.

191.—Studies and Experiments Connected with Cereal Cultivation in Italy.—STRAMPELLI, N., *Nuovi Annali del Ministero per l'Agricultura*, Year II, No. 2, p. 311-333. Rome, 1922.

223.—Studies on Swine Feeding.—I. SPOTTEL, W. and TANGER, E., *Zeitchrift fur Schweinezucht*, Part 10, pp. 145-152; Part II-pp. 164-166. Neudamm, 1922.

II. MULLER and RICHTER, *Ibidem*, Part 19, pp. 296-299, 1922

III. MULLER and SANDBRINK, *Deutsche Landwirtschaftliche Presse*, Year 49, No. 40, pp. 276. Berlin, 1922.

IV. THOMPSON, J. I. and VOORHIES, E. C., *College of Agriculture, Agricultural Experiment Station, Berkeley, California, Bulletin* No. 342, pp. 375-396. Berkeley, 1922.

V. STARKEY, L. V. and SALMON, W. D., *South Carolina Experiment Station of Ctemsoa Agricultural College Bulletin* 213, 8 pp. Clemson College, 1922.

227.—**Means of Controlling Diarrhœa and Arthritis in Foals**—CONN, G. H., *Live Stock Journal*, Vol. XCVII, No. 2545, p. 39. London, 1923.

243.—**The Scientific Feeding of Dairy Cows**—MALPEAUX, L., *Le Lait*, Year 2, No. 9, pp. 778-786. Lyons, 1922.

254.—**Selecting and Rearing Brood Sows.**—*Live Stock Journal*, Vol. XCVI, No. 2538, p. 520. London, 1922.

255.—**Toe-Pecking in Chickens.**—GRASHUIS, J., *Tijdschrift voor Diergeneeskunde*, P 50, p. 43-44. Utrecht, 1923.

278.—**Electric Power for Country Districts.**—DELAMARE, A. H. C., *Journal d'Agriculture Pratique*, Vol. 37, No. 24, pp. 481-482; Vol. 37, No. 25, pp. 502-503. Paris, 1922.

280.—**Steam Horse Power and Living Horse Power.**—RINGLEMANN, H., *Journal d'Agriculture Pratique*, Vol. 38, No. 36, pp. 215-217, Paris, 1922.

297.—**Ensilage Experiments Made in Germany.**.—VAN WENCKSTERN, H., *Deutsche landwirtschaftliche Presse*, Year 49, No. 14, p. 104. Berlin, 1922.

301.—**The Preservation of the Purity of Milk.**—DE MONTCAULT, P., *Journal d'Agriculture Pratique*, Year 86, Vol. 2, No. 43, pp. 349-350. Paris, 1922.

304.—**Variations in the Microbic Content of Butter in Cold Storage.**—DALLA TORRE, G.—*Annali del l'Institute sperimentale di Caseificio in Lodi*, Vol. I, No. 5-6, pp. 169-198. Lodi, 1922.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS.

The following is a brief summary of the contents of the more important articles in the July-September number of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

The Country Life Movement in the United States.—After an account of pioneer life in the United States from 1790 to 1880 the author gives a summary statement of the work of the Country Life Commission appointed by President Roosevelt in 1908. The report of the Commission although not acted upon by Congress aroused the interest of the nation in rural conditions. The article then deals with the rural housing problem, rural schools, the rural church, rural health, rural trade centres, and rural municipalities. A list of books on country life literature is given, including those giving the results of social surveys.

Latifundia in Sicily and their Possible Transformation.—34 pages. The *latifundia* are large estates under a single management on which extensive cereal cultivation alternating with pasture is carried on. The author gives an interesting description of agriculture in Sicily, describes the social and economic factors of the *latifundium*, and the process of breaking them up into small holdings.

The Central Co-operative Banks of The Rural and Agricultural Co-operative Societies in Germany.—25 pages. The co-operative central banks which are the subject of this article are a group of central co-operative societies. They are co-operative credit societies, but their dealings are not confined to co-operative credit societies merely, but cover all the various rural and agricultural co-operative societies. They are the banks of the individual co-operative societies. Their shareholders (members) are the individual co-operative societies, and just as the farmer's business is bound up with the work of the society he has joined, so the business of the single societies is bound up with that of the central banks, of which they are constituent members.

It is the business of the central co-operative banks to assist the individual societies at points where on account of their isolation their power of acting for their members is too much restricted. They are confined, however, to financial transactions. As regards co-operative credit societies, the central banks undertake all the business of investing or obtaining capital according as the individual society has a surplus or a deficit.

The central banks act as financing institutions for the co-operative trading societies. Their co-operative functions consist in carrying out the business operations resulting from the credit transactions they effect between the societies. The co-operative societies assign to the central banks the following functions:—

1. The opening of deposit accounts with interest for surplus funds, with repayment at sight, or after notice given.

2. The granting of credit with certain conditions as to interest and commission, such conditions not to prejudice the profits of the business of the debtor societies, together with such conditions as to repayment as take into account the particular activities of the debtor societies. Securities are required, though these are not such as are usual in the case of ordinary commercial banks.

These two main functions have been established and carried out from the first, but as time went on the following were added:

3. Precautionary measures in respect of the maintenance of the solvency of the whole group of interests, *i.e.*, of the central bank and of the affiliated co-operative societies.

4. Advice to the societies as regards their investments and transactions in relation to them, *e.g.*, the redemption of bonds as drawn, control of claims to be made in reference to bonds, the payment of dividend warrants and their renewal, safe-custody of securities, etc.

5. Payments without actual transfer of cash.

To sum up, single societies by the fact of their isolation are incapable of successful dealing on the money market. The function of the central banks is to establish relations between the societies and the money market and to maintain such relations when once created.

The article deals further with the legal form of the central banks, the different forms of centralization, capitalization, the organization of the banks, the conditions on which the supply of credit is based, administration of the central banks, etc.

Other Articles in the July-September Number

Provident Land Clubs in Spain; Agricultural Economic Questions at the Eleventh International Agricultural Congress, Paris, May, 1923; Rebuilding of Villages and Farms in France by Co-operative Societies; National Federation of Associations for the Supply of Electricity in Rural Districts in France; The Capitalization of Agricultural Organizations in Germany; Agricultural Co-operation in England and Wales in 1921-22; Agricultural Co-operation in Scotland in 1921; Agricultural Co-operation in Ireland in 1920-21; Recent Statistics of the Italian Popular Banks; Agricultural Co-operation in South Africa in 1922; The Mortgage Loan Bank of Chili; The Consolidating Law on Agricultural Credit in Italy; The Land and Agricultural Bank of South Africa; The Club Markets of South Carolina; Progress of Land Settlement in Australia; Agrarian Reform in Hungary; Small Rural Property in Italy; Changes in the Occupancy, Ownership and Tenancy of Farms in the United States During 1922.

CURRENT NOTICES.

Decree Respecting the Control of the Colorado Beetle of Potatoes in France.

The Journal officiel de la République française (No. 57 under date of February 27, 1923) has published the decree of February 13, 1923 which contains the regulations of the authorities for the application of the law of July 13, 1878, amended by the law of July 13, 1922, dealing with the measures to be adopted for the control of the Potato Colorado Beetle. (*International Institute of Agriculture Bureau of Agricultural Legislation, Textes législatifs de l'année 1923*, No. 1.).

Law Relating to the Export of Cattle into Great Britain.

(December, 1922)—Under the terms of this law (except in cases specially mentioned), it is permitted to import into Great Britain, Canadian breeding-cattle without their treatment, or slaughter, according to the provisions of the first part of the third appendix of the law of 1894 dealing with stock diseases. This law is provided with an appendix for the regulation of the trade in imported cattle. (*International Institute of Agriculture, Bureau of Legislation, Textes législatifs de l'année, 1922, No. 30*).

The New Zealand Dairy Industry Amendment Act of 1922.

This Act regulates the analysis of the milk fat to be used in the manufacture of milk-products and requires the managers of milk-product factories to register the amount of milk consigned by each producer and the yield of the said milk in cream, butter and cheese; a copy of the registration form must be given to every supplier of dairy produce.

School of Agricultural Mechanics at Mons (Belgium).

This school was founded in 1902 with the object of acquainting agriculturists with the most improved types of machines and teaching them how to handle, repair and keep them in order. This school was the first of the kind ever

instituted either in Belgium, or elsewhere, In 1907, the School passed under the management of the Province which fitted it up with large plants. On November 4, 1920, the Provincial Council voted the credit necessary for opening a section for students learning to make agricultural machines. The workshop of this new section, which has an entirely modern equipment, started normal work on December 1, 1922, with a dozen students. The course of study and the apprenticeship last two and a half years. Pupil machine-drivers are not admitted under 16 years of age. They attend the courses and the repairs-workshop for three months and learn to drive and keep in order the machines by practical work in the open during the proper season. Particulars of the course and the regulations can be obtained from the "Direction de l'Ecole de Mécanique agricole", 25 Boulevard des Etats-Unis, Mons, Belgique.

Agricultural Experiment Station of Rhode Island State College, United States.

Bulletin No. 190 of this Station deals with the assimilation powers of certain cereals and their susceptibility to fertilizers. By assimilation is understood the capacity of the plant to abstract from the soil the substances necessary to its existence without recourse being had to fertilizers. The bulletin gives the results of 10 years' experiments made in the field and in pots with the object of determining this capacity.

Agricultural Experiment Station of Wisconsin University, Madison.

Bulletin No. 346 of this Station, entitled Marketing by Co-operative Sales Companies, treats of the co-operative sale of Wisconsin cheese by means of these Sale Companies. The cheese has been sold in this way for eight years by the Wisconsin Cheese Producers' Federation. The success obtained warrants the foundation of similar Companies for the sale of butter, tobacco, livestock and other agricultural products. The bulletin explains the special advantages of Co-operative Sale Companies and suggests a scheme for their formation.

Re-Organization of Cheese-Making Research and Instruction in Italy and Abroad.

About 40 million hectolitres of milk are produced annually in Italy, at least half being absorbed by the dairy industries, while the rest is consumed in its natural condition. There are over 6,000 cheese factories in the country; these are situated chiefly in Lombardy, Emilia, Piedmont, and Venoto. Less than 1,200 of the factories are run on co-operative lines, and about 80 per cent do not work up more than 10 quintals of milk per day. The annual output of dairy products is about 2 million quintals of cheese and 250,000 quintals of butter.

The existing scientific and teaching institutes devoted to the dairy industry are mentioned. Similar information is furnished for Switzerland, France, Germany, Sweden, Hungary and Argentina.

The Recommendations of the XI International Congress.

On May 28 last, the *Congrès international d Agriculture* which had been atended by the delegates of many States, terminated its work at Paris. At its closing session, the International Agricultural Commission was complete, the representatives of two new States, Poland and Czecho-Slovakia being also included.

Then follow expressed in brief terms, the resolutions passed and the recommendations made by the Congress with a notice to the effect that those recommendations, which specially refer to questions of agricultural economy, are given *in extenso* in the *Rivista Internationale delle Istituzioni Economiche e Sociali*, Year I, No. 3.

I. *Section: Agriculture.*—(1) *The Legislative protection of new plants*, which are to be regarded as patented products, exact and severe regulations to be passed to prevent the fraudulent sale of new varieties of seed-wheats and to control the names under which they are sold. (2) *The Constitution of an International Association of Plant Selectionists* surported by the various Governments and connected with similar national Associations. (3) *The Co-ordination of Studies of Cereal Rusts*, it being suggested that for the present, Hayes and Stakman's scale should be adopted for determining rust resistance. (4) *Protective Measures Against Degeneration in Potatoes* based on systematically conducted studies, the encouragement and popularization of seed tubers selection, the selection being controlled and guaranteed by a certificate of authenticity, th immunity of the seed potatoes from the serious parasites, *Doryphora* and *Synchytrium* being especially vouched for by a certificate of the country of origin. (5) *The widest employment of agricultural machines* favoured by the Governments and Associations and the *organiization of practical instruction for rural mechanics.*

II. Section: *Influence of Agriculture upon International Relations.* (1) *Development of international relations between Agricultural Associations with the object of peace propaganda* (See, *Riv. Int. delle Istitutuzione Economiche e Sociali* mentioned above. (2) *International Institute of Agriculture.* Recognizing the services already rendered by this Institute, the Governments ought to study the means by which its efficiency can be increased in order that agriculturists may in their turn derive the fullest benefit from its work. (3) *Unification of the methods of customs control* on the basis of the conclusions announced by the International Conference held at Paris in 1910. (4) *Regulation of the trade in commercial products.* (See *Riv. Int. delle Istituzioni Economiche e Sociale* already mentioned).

III. Section: *Rural Economy.*—For most of the recommendations made respecting this section, and in particular for: (1) *The material and moral improvement of rural workers:* (2) *Agricultural Associations;* (3) *The System of Land Transfer in various countries and the means of reducing its cost;* (4) *Agricultural profits and fiscal burdens on agriculture;* (5) *Financial independence of professional agricultural organizations;* (6) *Agricultural Politics;* (7) *Improvement of the social conditions of agricultural workers.* See *Riv. Int. delle Istit. Econ. e Soc.* mentioned above. As regards agricultural bookkeeping, it was suggested that the elementary knowledge of this subject should be imparted in rural districts by means of instruction in the schools and text books on the subject, and that co-operative societies should institute special bookkeeping offices for the assistance of all agriculturists and especially of the poorest; special instruction being provided for training administrators, directors, and bookkeepers for the various agricultural associations. It was also suggested that similar methods of analyzing agricultural management should be adopted in all countries, in order to facilitate international exchange of views.

IV. Section: *Cattle Economics.*—Institutions for the *control of the yields and feeding of milch cows* would afford a means of developing and selecting dairy stock. The Congress not only recommends an extensive propaganda in order to extend the cultivation of forage crops, but also urges the institution and development of co-operative dairies, the formation of syndicates for the common purchase of breeding stock, and the wholesale purchase of stock-feeders, fertilizers, etc.; the development of good cheese-making schools; the organization of rapid means of transporting milk and its derivatives; the adoption in the different countries of uniform measures for controlling milk and butter production (sample-taking, weighing, certificates); the practical and scientific instruction of expert milk controllers (2) The Congress urges the necessity of the different countries to adopt the same rules for judging breeding-stock (these rules being in accordance with the principles directing scientific breeding) and the regulations for the registration of stock in *pedigree books.* The latter, for instance, should be *closed,* and after they are closed, no animals should be registered unless they are the offspring of parents already on the register, in which case, as a rule, a confirming test is also to be required. (3) the adoption in the various States of *health certificates* and of *certificates of origin,* like those granted in Holland, was also recommended. (4) The formation of a *Permanent International Breeding Office* to deal with matters relating to the improvement and economics of live stock was proposed. (5) *The unification of breeding methods was recommended.* (6) Also a detailed bookkeeping system supplying exact data respecting mechanical traction and finally. (7) the Congress recommended that the study of foot-and-mouth disease should be carried out in all the different States.

V. Section: *Vine-growing.*

VI. Section: *Sylviculture.*

VII. Section: *Agriculture in Tropical Countries.*

French Competition for the Cultivation of the Finest Ear of Wheat (1923).

This competition was organized by the Bourdeaux Press, and has been held every year from, and including 1918. It is under the patronage of the Ministry of Agriculture, the Departmental Agricultural Office of the Gironde and other bodies.

The objects of the competition are: (1) to promote and popularize the practice of selecting the hardiest local varieties of wheat producing most grain and which have the highest milling and breadmaking yield, in order to obtain the maximum production of good bread per unit of surface; (2) to interest the youth of France in wheat cultivation. Further information is given under the heads: classification of the ears; technical part; selection, cultivation; final classification.

Sowing by Aeroplane.

Sowing from an aeroplane has been carried out in California, where in the neighbourhood of Lake Tulare the soil is excessively damp and cannot be worked at the sowing season, which makes it very difficult to carry out seeding in the ordinary manner. Finally an aviator flying at a height of 15 m. succeeded in scattering 360 kg. of seed over 6.5 hectares of this land. The seeds went deep enough into the soil to insure germination. The cost of this method of sowing is estimated at $6 per acre. (*Cerealia*, March 6, 1923).

AGRICULTURAL STATISTICS

THE WHEAT, RYE AND POTATO CROPS OF 1923

WORLD'S PRODUCTION OF WHEAT

Countries	Area			Production			Yield per Acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	M acres	M acres	M acres	M bush.	M bush.	M bush.	bush.	bush.	bush.
EUROPE:—									
Germany	3,653	3,396	3,380	103,605	71,934	89,798	28·4	21·1	26·4
Austria	475	460	373	8,826	7,422	5,693	18·6	16·1	15·4
Belgium	341	300	331	12,589	10,615	11,778	36·9	35·4	35·6
Bulgaria	2,259	2,226	2,208	38,783	37,705	29,621	17·2	16·9	13·4
Denmark	205	237	160	(a)8,600	9,949	7,017	42·0	41·9	43·9
Spain	10,489	10,309	10,318	157,112	125,470	138,279	15·0	12·2	13·4
Jugoslavia	3,606	3,723	3,630	61,894	44,472	47,411	17·2	11·9	13·1
Finland	31	22	21	472	296	335	15·2	13·5	16·0
France	13,657	13,072	12,507	290,477	243,317	249,165	21·3	18·6	19·9
England and Wales	1,741	1,967	2,109	56,560	62,492	65,698	32·5	31·8	31·2
Greece	1,071	890	1,044	13,356	9,553	10,722	12·5	10·7	10·3
Hungary	3,411	3,523	2,775	67,677	54,729	45,505	19·8	15·5	16·4
Italy	11,555	11,489	11,088	224,838	161,643	166,367	19·5	14·1	15·0
Latvia	64	70	46	1,273	958	784	19·9	13·7	17·0
Lithuania	202	194	163	3,165	3,374	2,562	15·7	17·4	15·7
Luxemburg	25	23	26	522	173	478	20·9	7·5	18·4
Norway	25	25	37	549	643	912	22·0	25·7	24·6
Netherlands	153	150	154	6,678	6,063	5,773	43·6	40·4	37·5
Poland	2,514	2,574	2,123	48,272	42,451	37,723	21·2	16·5	17·8
Portugal	1,123	1,123	1,033	12,964	9,782	8,997	11·5	8·7	8·7
Roumania	6,632	6,548	5,524	112,939	92,008	69,937	17·0	13·1	12·7
Sweden	363	356	354	11,648	9,381	9,613	32·1	26·4	26·2
Switzerland	160	152	182	5,453	3,571	5,637	34·1	23·5	31·0
Czechoslavakia	1,507	1,527	1,561	36,537	33,621	32,522	24·2	22·0	20·8
Total Europe	65,262	64,356	61,147	1,284,789	1,041,622	1,042,327	19·7	16·2	17·0
NORTH AMERICA:—									
Canada	22,673	22,423	18,546	469,761	399,786	236,025	20·8	17·8	12·8
United States	58,253	61,230	60,960	785,741	862,000	834,802	13·4	14·1	13·7
Total North America	80,926	83,653	79,506	1,255,502	1,261,786	1,070,827	15·5	15·1	13,5
ASIA:—									
India	30,835	28,207	29,628	369,263	366,985	330,884	12·0	13·0	11·2
Japan	1,198	1,229	1,338	26,483	27,617	29,951	22·1	22·5	22·4
Total Asia	32,033	29,436	30,966	395,746	394,602	360,835	12·4	13·4	11·7
AFRICA:—									
Algeria	3,157	3,103	3,043	35,611	18,233	28,512	11·3	5·9	9·4
Egypt	1,537	1,518	1,275	40·654	36·648	32,167	26·5	24·1	25·2
Morocco	2,319	2,068	1,880	23,549	12,894	19,187	10·2	6·2	10·2
Tunis	1,433	882	1,454	9,921	3,674	8,416	6·9	4·2	5·8
South Africa	884	884	884	(a)7,000	6,696	7,984	7·9	7·6	9·0
Total Africa	9,330	8,455	8,536	116,735	78,145	96,266	12·5	9·2	11·3
SOUTH AMERICA:—									
Argentina	17,216	15,940	16,360	248,755	189,047	192,752	14·4	11·9	11·8
Chile	1,376	1,285	1,233	(a)23,000	23,815	21,987	16·7	18·5	17·8
Uruguay	979	663	802	(a)8,000	5,152	8,722	8·2	7·8	10·9
Total South America	19,571	17,888	18,395	279,755	218,014	223,461	14·3	12·2	12,1
AUSTRALASIA:—									
Australia	10,000	9,959	8,595	120,000	107,263	102,263	12·0	10·8	11·9
New Zealand	183	276	240	(a)8,000	8,416	7,075	.....	30·5	28·5
Total Australasia	10,183	10,235	8,835	128,000	115,679	109,338	12·6	11·3	12·4
GRAND TOTAL	217,305	214,023	207,385	3,460,527	3,109,848	2,903,054	15·9	14·5	14·0

(a) Unofficial figures.

WORLD'S PRODUCTION OF RYE

Countries	Area			Production			Yield per Acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	M acres	M acres	M acres	M bush.	M bush.	M bush.	bush	bush.	bush.
Germany	10,786	10,237	10,628	282,455	206,051	233,180	26·2	20·1	21·9
Austria	921	834	730	15,634	13,589	10,765	17·0	16·3	14·7
Belgium	558	531	535	19,538	18,284	17,982	35·0	34·4	33·6
Bulgaria	457	442	465	8·480	7,453	6,186	18·6	16·9	13·3
Denmark	574	547	536	15,000	14,284	12,390	26·1	26·1	23·1
Spain	1,802	1,757	1,803	28,076	26,252	26,779	15·6	14·9	14·9
Esthonia	388	392	343	6,847	5,797	5,710	17·6	14·8	16·6
Jugoslavia	395	499	475	5,913	4,523	5,953	15·0	9·1	12·5
Finland	583	578	586	9,446	7,775	9,918	15·2	13·5	16·9
France	2,171	2,196	2,128	36,915	38,412	35,700	17·0	17·5	16·8
Greece	217	198	222	2,662	2,362	3,151	12·3	11·9	14·2
Hungary	1,650	1,663	1,408	32,111	25,148	21,856	19·5	15·1	15·5
Italy	311	320	316	6,449	5,563	5,675	20·7	17·4	18·0
Latvia	660	590	561	10,992	6,845	9,806	15·7	11·6	17·4
Lithuania	1,442	1,369	1,196	24,924	24,249	18,336	17·3	17·7	15·3
Luxemburg	20	20	19	409	250	360	20·5	12·5	18·9
Norway	30	30	35	832	862	955	27·7	28·7	27·3
Netherlands	515	500	486	15,393	16,884	14,387	29·9	33·8	29·6
Poland	11,478	11,225	9,619	197,116	197,394	175,860	22·4	17·6	18·3
Portugal	665	665	671	5,372	5,294	4,392	8·1	8·0	6·5
Roumania	651	659	793	10,196	9,206	9,263	15·7	14·0	11·7
Sweden	870	872	903	25,354	22,678	20,959	29·1	25·0	23·2
Switzerland	48	55	51	1,646	1,693	1,576	34·3	30·8	30·9
Czechoslovakia	2,125	2,174	2,202	51,813	51,098	43,338	24·5	23·5	19·7
Total Europe	39,317	38,353	36,711	813,573	711,946	694,477	22·2	18·6	18·9
Canada	1,448	2,105	802	26,937	32,373	11,066	18·6	15·5	13·8
United States	5,234	6,210	5,465	64,774	95,497	70,426	12·4	15·4	12·9
Argentina	315	207	179	3,701	2,155	923	11·8	10·4	5·2
GRAND TOTAL	46,314	46,875	43,157	908,985	841,971	776,892	20·9	18·0	18·0

Countries	1923	1922	Average 1917-21
	bush.	bush.	bush.
Germany	1,156,317,000	1,494,195,000	922,148,000
Austria	47,384,000	51,378,000	25,112,000
Belgium	88,853,000	144,454,000	86,126,000
Bulgaria	1,220,000	1,360,000	1,311,000
Denmark	44,000,000	49,249,000	44,213,000
Spain	95,497,000	108,598,000	104,024,000
Esthonia	28,981,000	26,373,000	22,081,000
Finland	15,800,000	16,009,000	19,231,000
England and Wales	99,157,000	149,781,000	122,394,000
Hungary	63,044,000	48,491,000	61,022,000
Italy	62,464,000	53,690,000	59,654,000
Lithuania	55,171,000	67,902,000	43,597,000
Luxemburg	6,173,000	7,007,000	5,046,000
Norway	28,610,000	32,699,000	32,728,000
Netherlands	81,947,000	136,623,000	102,388,000
Poland	1,055,213,000	1,221,588,000	(a)635,650,000
Sweden	61,252,000	74,788,000	68,692,000
Switzerland	63,292,000	24,820,000	30,898,000
Czechoslovakia	231,065,000	333,235,000	171,441,000
Total Europe	3,285,440,000	4,042,240,000	2,557,756,000
Canada	101,777,000	92,908,000	110,198,000
United States	416,720,000	451,185,000	381,876,000
Algeria	863,000	2,146,000	1,317,000
GRAND TOTAL	3,804,800,000	4,588,479,000	3,051,147,000

(a) The year 1921.

In the above table, showing details of the world's acreage and production of wheat, there are some differences from the figures given in the table published in the November-December number of the Agricultural Gazette. There are increases over former estimates for Spain, Italy, the United States and Australia, and a decrease in the estimate for Poland.

The total area sown to wheat, 217,000,000 acres is an increase of 3,000,000 acres over last year, and of 10,000,000 over the five year average. Europe shows an increase of 1,000,000 acres over last year, and North America a decrease of nearly 3,000,000 acres. A striking feature is the increase of over 1,000,000 acres in Argentina.

With official estimates received from practically all the countries in the world, excluding Russia, the total production of wheat in 1923 is shown to be 3,461,000,000 bushels against 3,110,000,000 in 1922 and 2,903,000,000 bushels the average of the five years 1917-21, an increase of 351,000,000 bushels over last year and 558,000,000 over the five year average. The yield per acre for the five year period is 14 bushels. It was 14·5 for 1922 and 15·9 for 1923.

The total production in Europe is 1,285,000,000 bushels, an increase of 243,000,000 over last year and of the same amount over the five year average. North America shows a decrease of 6,000,000 bushels from last year, North Africa an increase of 39,000,000 bushels, South America an increase of 62,000,000, and Australasia an increase of 12,000,000.

In a recent cable the Institute states that "the estimated exportable surplus of wheat in all the exporting countries for the current grain year is 950 million bushels and the estimated requirements of the importing countries amount to 717 million bushels."

These import figures, given as prospective for the current year, are the actual ones for the preceding year, but the exportable surplus figures are merely theoretical and take no account of unmerchantable grain or waste and of the necessary normal carry-over. In Canada, official inspections from September 1st to December 10th show only 85·32 per cent of contract grade wheat compared with 92·40 per cent to same date last year. If the Canadian grades continue in the same proportion, over 14 per cent will have to be deducted from the total shipments from the farms, and it is known the producers will not ship wheat believed to be under grade and even of a grade that will be more profitable as hog and poultry feed. The United States do not report under-grade wheat at the terminal markets, but it is recognized that even a larger proportion is non-contract or retained on the farm for feed. It is estimated 11½ per cent is being retained there for the latter purpose. Hence, even assuming that the official reports of other exporting countries do not comprise so large a proportion of under-grade or waste wheat, the theoretical surplus inferred from the Institute report as carry-over Augsut 1st next, viz., 233 million bushels, will decrease to the requisite normal for immediate home needs. Probably this will be the case if the exports for the current year are to approximate those of the preceding year; and actual exports to November 24th run only 11 million bushels behind them, notwithstanding the late movement of the Canadian crop. The imports to Great Britain to same date are 13 million bushels ahead of last year's.

The comparative failure of the potato crop in Europe has profoundly modified the European demand for wheat. For Europe alone, excluding Russia, (also France not yet reported), there is a shortage of nearly 797 million bushels. The shortage in some of the most important wheat importing countries is significant. The figures for 1923 are given first, and those for 1922 in brackets, followed by the amount of decrease; Germany, 1,156,317,000, (1,494,195,000), 337,878,000 bushels; Belgium, 88,853,000 (144,454,000), 55,000,000; England and Wales 99,157,000 (149,781,000), 50,624,000, Holland, 81,947,000, (136,623,000), 54,676,000; Czechoslovakia, 231,065,000 (333,235,000), 101,670,000. The decreases for these five countries amount to 599,849,000 bushels. Poland, usually an exporter to Central Europe, decreased its production by 166,375,000 bushels.

It is true that the total European crop for 1923, although 757 million bushels smaller than the previous year's, was still 727,684,000 bushels larger than the average of the years 1917-21 when, in consequence of the war, hoed crops were reduced to a minimum. On the other hand, in the huge European potato crop of 1922, coincident with a small wheat crop, there is some explanation of the fact that wheat imports were much under the theoretical supplementary requirements estimated for normal annual consumption. Theoretically there was expected a European import 200 million bushels larger than the previous year's whereas there was an actual increase of only 15 million. This year, with an increase of 243 million bushels in the European wheat crop but a drop of 757 million bushels (so far reported) in potatoes, there is one explanation why wheat exports so far reported are almost equal to those of the same date last year and give good promise of a world's total approximating last year's. Although the production of European rye is about 100 million bushels greater than that of the preceding year, this will not materially arrest the satisfactory progress of wheat imports already firmly established.

Our communication to the November-December issue of the Agricultural Gazette, made on November 20th, forecast total

import requirements of 682 million bushels (Europe, 562 million; ex-Europe, 120 million) against 632 million, estimated by Mr. Broomhall about that time. The latter, in his issue of December 4th, raised his estimate to 688 million bushels of which 128 million ex-Europe.

If imports should continue at the rate established since the beginning of the current grain year, Mr. Broomhall estimates they will reach a total of 724 million bushels. As part of the imports are not at all or only tardily recorded, it is not improbable that the theoretical total of 717 million mentioned by the Institute will eventually be approximated.

FOREIGN CROP CONDITIONS

(December 20, 1923)

Great Britain.—Seeding of winter wheat was practically completed by December 1st. A slight decrease in acreage is indicated. November weather was very wet, which hindered seeding somewhat.

Germany.—The second half of October was very wet and seeding was delayed. November was favourable to the development of winter wheat and rye and their condition was above average. There is reason to believe that the acreage is at least as large as last year.

France.—The appearance of winter crops on December 1st was good. They have made a very promising start.

Italy.—At the end of November the weather was warm and rainy. Reports regarding the growing crops were satisfactory.

Roumania.—There are complaints of drought, but in the majority of districts the wheat acreage has been maintained.

Jugoslavia.—Autumn sowings were brought to a close about the end of October. At the end of November further heavy rains were reported, and the crops were in good condition.

Bulgaria.—Preparatory field work was delayed owing to the lack of moisture, and sowings were started under unfavourable conditions.

Spain.—Timely rains enabled seeding to be terminated under very fair conditions, but the moisture supply was still regarded as inadaquate.

Russia.—A *Times* correspondent asserts that the Soviet Agricultural Commissariat has received information that sowings of winter grain have been reduced 25 to 50 per cent owing to drought, and in some parts partial famine prevails.

North Africa.—At the end of November the agricultural situation showed considerable improvement in Algeria, Tunis and Morocco.

India.—In the first part of November there were complaints of lack of moisture in the big wheat growing regions of the North Later the outlook was described as favourable in the Central Provinces, and normal to good in the United Provinces. It is expected that the wheat acreage will be less than that of last year.

Australia.—Harvest weather was favourable and the wheat crop was turning out well.

Argentina.—It rained heavily in the South during the last week of November and some damage to the wheat crop was reported. Elsewhere the weather was very favourable. With reference to the heavy rains reported in Argentina, it may be recalled that the wheat crop of 1920 was probably reduced, in some degree, by this cause. Rains were experienced over a wide area in the first half of December of that year, and although little importance was attached to them at the time, yet the Government were eventually obliged to reduced the total estimate of the crop from 184 million to 156 million bushels.

UNITED STATES FINAL CROP REPORT.

The December estimates of the Crop Reporting Board of the United States Department of Agriculture of the acreage, production and value (based on prices paid to farmers on December 1) of the important farm crops of the United States in 1921, 1922 and 1923, based on the reports of correspondents and field statisticians. The figures here published for both 1922 and 1923 have been revised on the basis of the latest and fullest information now available. The revised figures here shown, and not the unrevised figures previously published, should be compared to obtain the proper relation of the 1923 acreage and production to that of 1922 and earlier years. The figures follow:—

Crop	Acreage	Production		Farm Value December 1	
		Per acre	Total	Per unit	Total
				cents	$
Corn, 1923, bushels	104,158,000	29·3	3,054,395,000	72·7	2,222,013,000
1922	102,946,000	28·3	2,906,020,000	65·8	1,910,775,000
1921	103,740,000	29·6	3,068,569,000	42·3	1,297,213,000
Winter Wheat, 1923, bushels	39,522,000	14·5	572,340,000	95·0	543,825,000
1922	42,358,000	13·8	586,878,000	104·7	614,399,000
1921	43,414,000	13·8	600,316,000	95·1	571,044,000
Spring Wheat, 1923, bushels	18,786,000	11·4	213,401,000	85·1	181,676,000
1922	19,959,000	14·1	280,720,000	92·3	259,013, 00
1921	20,282,000	10·6	214,589,000	85·6	183,790,100
All Wheat, 1923, bushels	58,308,000	13·5	785,741,000	92·3	725,501,000
1922	62,317,000	13·9	867,598,000	100·7	873,412,000
1921	63,696,000	12·8	814,905,000	92·6	754,834,000
Oats, 1923, bushels	40,800,000	31·8	1,299,823,000	41·5	539,253,000
1922	40,790,000	29·8	1,215,803,000	39·4	478,948,000
1921	45,495,000	23·7	1,078,341,000	30·2	325,954,000
Barley, 1923, bushels	7,905,000	25·1	198,185,000	54·0	106,955,000
1922	7,317,000	24·9	182,068,000	52·5	95,560,000
1921	7,414,000	20·9	154,946,000	41,9	64,934,000
Rye, 1923, bushels	5,157,000	12·2	63,023,000	64·7	40,804,000
1922	6,672,000	15·5	103,362,000	68·5	70,841,000
Buckwheat, 1923, bushels	737,000	18·9	13,920,000	93·3	12,984,000
1922	764,000	19·1	14,564,000	88·5	12,889,000
1921	680,000	20·9	14,207,000	81·2	11,540,000
Flax seed, 1923, bushels	2,061,000	8·5	17,429,000	210·8	36,733,000
1922	1,113,000	9·3	10,375,000	211·5	21,941,000
1921	1,108,000	7·2	8,029,000	145·1	11,648,000
Rice, 1923, bushels	892,000	37·3	33,256,000	110·3	36,686,000
1922	1,055,000	39·2	41,405,000	93·1	38,562,000
1921	921,000	40·8	37,612,000	95·2	35,802,000
Potatoes, White, 1923, bushels	3,941,000	108·1	412,392,000	92·3	339,322,000
1922	4,307,000	105·3	457,396,000	58·1	263,355,000
1921	3,941,000	91·8	361,659,000	110·1	398,362,000
Sweet Potatoes, 1923, bushels	993,000	97·9	97,177,000	97·9	95,091,000
1922	1,117,000	97·9	109,394,000	77·1	84,295,000
1921	1,066,000	92·5	98,654,000	88·1	86,894,000
Hay, tame, 1923, tons	60,162,000	1·48	89,098,000	$14·07	1,253,364,000
1922	61,159,000	1·57	95,882,000	$12·56	1,204,101,000
1921	58,769,000	1·40	82,379,000	$12·11	997,527,000
Hay, wild, 1923, tons	15,722,000	1·11	17,528,000	$ 7·85	137,603,000
1922	15,871,000	1·02	16,131,000	$ 7·14	115,176,000
1921	15,632,000	0·98	15,391,000	$ 6·63	101,991,000
All Hay, 1923, tons	75,884,000	1·41	106,626,000	$13·05	1,390,967,000
1922	77,030,000	1·45	112,013,000	$11·78	1,319,277,000
1921	74,401,000	1·31	97,700,000	$11·25	1,099,518,000
Tobacco, 1923, lbs	1,820,000	810·0	1,474,786,000	20·3	298,936,000
1922	1,695,000	736·0	1,246,837,000	23·2	289,248,000
1921	1,427,000	750·0	1,069,693,000	19·9	212,728,000
Cotton, 1923, bales	3,742,000	128·8	10,081,000	31·0	1,563,347,000
1922	33,036,000	141·5	9,761,817	23·8	1,161,846,000
1921	30,509,000	124·5	7,953,641	16·2	643,933,000
Cottonseed, 1923, tons	....	....	4,476,000	$42·92	205,538,000
1922	....	....	4,336,000	$40·18	174,220,000
1921	....	....	3,531,000	$29·15	102,929,000
Clover Seed, 1923, bushels	800,000	1·5	1,233,000	$12·19	15,027,000
1922	1,156,000	1·6	1,887,000	$10·05	18,971,000
1921	889,000	1·7	1,538,000	$10·75	16,529,000
Sugar Beets, 1923, tons	651,000	10·59	6,893,000	$7·24	49,890,000
1922	530,000	9·77	5,183,000	$7,91	41,016,000
Beet Sugar, 1923, tons	651,000	1·36	884,000	....	....
1922	530,000	1·27	675,000	....	....
Cane Sugar, Louisiana, 1923, tons	228,000	1·35	169,000	....	....
1922	241,000	1·22	295,000	....	....
Maple Sugar and Syrup (as Sugar), 1923, lbs	15,291,000	2·19	33,523,000	23·2	7,780,000
1922	16,274,000	2·11	34,263,000	21·9	7,504,000
Sorghum Syrup, gallons 1923	380,000	84·2	32,001,000	86·2	27,595,000
1922	447,000	81·5	36,440,000	71·0	25,855,000
1921	518,000	88·0	45,566,000	62·9	28,681,000

PRODUCTION AND INTERNATIONAL TRADE IN FERTILIZERS.

The International Institute of Agriculture has just issued a leaflet reproducing the tables of data on the production and trade in fertilizers and chemical products useful in agriculture published in the International Year Book of Agricultural Statistics for 1922. The following is a summary of the data presented in the tables.

Phosphatic Fertilizers.—The crisis brought about by the war, in the production of *natural phosphates*, the effects of which were already seen to be greatly reduced in the results of the mining seasons 1920 and 1921, may be said to have been completely surmounted in 1922.

The phosphate-producing countries of North Africa (Tunis, Algeria, Egypt and Morocco) yielded in 1922 altogether 2,583 thousand metric tons of phosphates, reaching almost the maximum production of 1913, which amounted to 2,736 thousand metric tons. Even though the yields of Tunis and of Egypt are still below their pre-war level, those of Algeria show an increase, whilst the mines of Morocco, which began work in 1921, had in 1922 already produced considerable quantities of phosphates. Thus, utilizing also the stocks remaining at the end of 1921, North Africa was able in 1922 to export 2,668 thousand tons of natural phosphates, surpassing any previous year.

In the United States, the production of phosphates in 1922 shows a diminution (2,457 thousand tons in 1922, as against 3,161 thousand in 1913); and the exports of this product show even a greater reduction (731 thousand metric tons in 1922, as compared with 1,388 thousand in 1913).

Regarding imports, the increasing arrivals in Germany during the years 1920, 1921 and 1922 are worthy of particular note, as also are the imports of Denmark, of France and of Italy and of the Netherlands, all of which exceeded those of 1913. On the other hand, the imports into Great Britain and Ireland and into Sweden show a decrease.

Salient among the data available as to the production of *superphosphates* in 1922, are those of France—the largest producer in Europe—which show a considerable increase over the pre-war yield; the actual production in 1922 being 2,133 thousand metric tons, a figure never hitherto attained by the French industry.

Showing a great increase on 1921, is also the 1922 yield of Germany,—which, nevertheless, was only equal to one-third of the pre-war production—, together with the yields of Great Britain and Ireland and of Belgium,—the last named country's yield being very little below that of 1913—, and also the production of Denmark, which resulted even considerably above the pre-war level.

The leader among the world's superphosphate-exporting countries in 1922 was Belgium, while Germany—a large exporter previous to the war—was one of the principal importing countries.

The production of *Basic slag* in 1922 showed a very marked increase on 1921 in France, Luxemburg, Great Britain and Ireland, and Germany. While Germany produced in 1922 a quantity equal to but half of that produced before the war, Luxemburg went beyond the pre-war yield, and France and Great Britain made great strides towards attaining it.

In the aggregate, however, taking into account the great diminution in the German yield, the world's output of basic slag was in 1922 below that of 1913. Germany's yield was so deficient that, whilst in 1913 the country's net exports of basic slag came to 270,000 metric tons, in 1922 she was buyer of an equal quantity, occupying first place among the importing countries.

Notwithstanding, the Netherlands and Great Britain and Ireland show an increase in their net imports of basic slag during 1922, as compared with the pre-war years; while Italy, Norway and Sweden show a decrease. The leading basic slag furnishing countries in 1922 were France and Belgium, whose total exports in that year showed a notable increase on those of 1921 and of 1913.

The *prices* of natural phosphates in the United States had in 1922 declined considerably, but in Algeria and Tunis they had risen above those of 1921 and the preceding years, and were more than double the 1913 prices.

Basic slag quotations in Belgium and France, since attaining their highest point in 1920, have had a constant tendency to decline, though still keeping at a level four times as high as in 1913.

Potash Fertilizers.—The potash industry, which in 1921 had already practically regained its pre-war position, continued in the following year to make even more notable progress. Germany, France and Poland yielded in 1922 altogether 1,512 thousand metric tons of potashes, expressed in K_2O, as compared with 1,070 thousand in 1921, and 1,168 thousand in 1913. The German mines alone delivered in 1922 about 380 thousand metric tons more than in the preceding year, exceeding by about 200 thousand metric tons the respective 1913 output, the greatest previously obtained and which included Alsace.

The German exports in 1922 did not reach their pre-war level; but, in compensation, home-consumption increased considerably.

France had in 1922 more than doubled her 1921 exports of potash fertilizers. Norway, the Netherlands, Sweden and the United States showed, on the other hand, a notable increase in imports on those of 1921, without, however, arriving at the pre-war figures.

The *price* of raw potashes in France, from May, 1921 onwards, kept constant at 43 centimes per unit; whilst in Germany sharp rises took place during 1922, due essentially, to the course of the exchange.

Nitrogenous Fertilizers.—The great transformation commenced in the nitrogenous fertilizer industry, — brought about by necessity, and the consequences of the war—, continued and was accentuated during 1922.

The yield of *nitrate of soda* in Chili came to 1,068 thousand metric tons, against 1,321 thousand in 1921. Thus it is seen that in 1922 the production was lower than in 1909 upwards, and not nearly half the yield obtained in 1913. The exports of nitrate of soda from Chili in 1922 were greater than those of 1921, and are still much less than half the exports of the last pre-war year.

The countries registering notable increases in imports of nitrate of soda in 1922 as compared with 1921, are Germany, Italy, Poland, the United States, Japan, and Egypt. Belgium, France and Spain, on the other hand, show a great decrease.

The amount of *nitrate of lime* produced by Norway continued to increase in 1922, reaching a maximum of 156,000 metric tons, as compared with 130,000 in 1921, and 73,000 in 1913. Likewise the Norwegian exports, which from 71,000 metric tons in 1913 and from 82,000 in 1921, rose to 158,000 metric tons in 1922.

As regards *cyanamide of calcium*, data showing production in 1922 are not forthcoming for a number of countries. Among the data available, worthy of particular note are those of the French out-turn, which, from 13,707 metric tons in 1920-21, increased to 29,000 in 1921-22 and to 42,000 in 1922-23.

Germany produced 238 thousand metric tons in 1922, as compared with 250 thousand in 1921, and 48·5 thousand in 1913.

Of special interest among the data dealing with *sulphate of ammonia*, are those concerning the 1922 yield in Germany, which amounted to 1,191 thousand tons, more than double that of 1913; also those for the United States, whose 1922 output of 474 thousand metric tons exceeded that of any previous year, and showed a threefold increase on the pre-war production.

The United States were therefore able, in 1922, to export about 150,000 metric tons of sulphate of ammonia, thus becoming the world's most important exporter of this fertilizer, surpassing even Great Britain and Ireland, who, heading the list in 1913 with exports of 328,000 metric tons, had in 1922 reduced the quantity sent abroad to 148,000 metric tons.

The principal importers of sulphate of ammonia in 1922, were Japan,—who in that year purchased from abroad 93 thousand metric tons—, and Spain, France and the Dutch East Indies, who each imported 70 to 75 thousand metric tons.

The *prices* of sulphate of ammonia in England remained, in 1922, generally below those of the preceding year; but there was quite an opposite tendency in the quotations on American markets.

Sulphur.—The Italian production in 1922 fell to 172 thousand metric tons, from 274 thousand in 1921 and 385 thousand in 1913. Exports, however, increased considerably as compared with 1921, a year of intense crisis in the sulphur trade of Sicily.

The United States, in 1922, maintained their sulphur out-turn (1,860 thousand metric tons) at almost its highest level, which was attained in the previous year, exceeding the 1913 yield by about 1,350 metric tons. The exports from the United States in 1922 amounted to 496 thousand metric tons, a figure never previously reached.

Regarding the countries which notably increased their imports of sulphur during 1922, both as compared with 1921 and with 1913, Germany, France, Great Britain and Ireland, Sweden and Canada may be mentioned.

The *prices* of sulphur, both in Italy and in the United States, were in 1922 fixed at a much lower level than in 1921. In the United States the monthly quotations were even below those obtaining before the war.

Sulphate of copper.—The yield of this product was for 1922 higher than for 1921 in France and in Great Britain and Ireland; but, whereas the French production showed a notable increase on the pre-war out-turn, the yield of Great Britain and Ireland resulted in a great decrease. Concerning the United States, data for 1922 are unavailable, but those for 1921 indicate a great diminution in production, especially in comparison with 1913.

Data relative to the Italian yield in 1922 are likewise unavailable; it may be affirmed however, that the recent extension of manufacturing plant now gives this country the lead as regards the copper-sulphate producing capacity.

The *prices of* sulphate of copper on the English market in 1922 showed a general tendency to decline.

LIVE STOCK STATISTICS.

NUMBERS OF LIVE STOCK IN ROUMANIA

Classification	Number		Increase (+) or decrease (−)	
	1922	1921	In number	Per cent
Horses	1,802,051	1,686,728	+ 115,323	+ 6·8
Mules	2,846	2,221	+ 625	+28·1
Asses	10,143	10,621	− 478	− 4·5
Cattle	5,745,534	5,520,914	+ 224,620	+ 4·1
Buffaloes	186,676	200,256	− 13,580	− 6·8
Sheep	12,320,569	11,194,047	+1,126,522	+10·1
Goats	551,712	573,900	− 22,188	− 3·9
Swine	3,146,806	3,132,004	+ 14,802	+ 0·5

Classification	Number		Increase (+) or decrease (−)	
	June 3, 1923	June 3, 1922	In number	Per cent
Horses	203,372	211,679	− 8,397	− 4·0
Cattle	1,190,033	1,146,807	+43,226	+ 3·8
Sheep	6,762,798	6,684,097	+78,701	+ 1·2
Swine	184,925	150,884	+34,041	+22·6

Classification	Number		Increase (+) or decrease (−)	
	July 16, 1923	July 15, 1922	In number	Per cent
Horses	561,531	575,773	− 14,242	− 2·5
Cattle	2,537,393	2,525,348	− 12,045	+ 0·5
Sheep	374,296	441,875	− 67,579	−15·3
Goats	41,874	44,024	− 2,150	− 4·9
Swine	2,852,826	1,899,019	+953,807	+50·2
Poultry	20,000,000	19,200,000	+800,000	+ 4·2

ARGENTINA

Classification	Number		Increase (+) or decrease (−)	
	December 31, 1922	June, 1914	In number	Per cent
Cattle	37,064,850	25,866,763	+11,198,087	+43·3
Sheep	30,671,841	43,225,452	−12,553,611	−29·0
Swine	1,436,638	2,900,585	− 1,463,947	−50·5

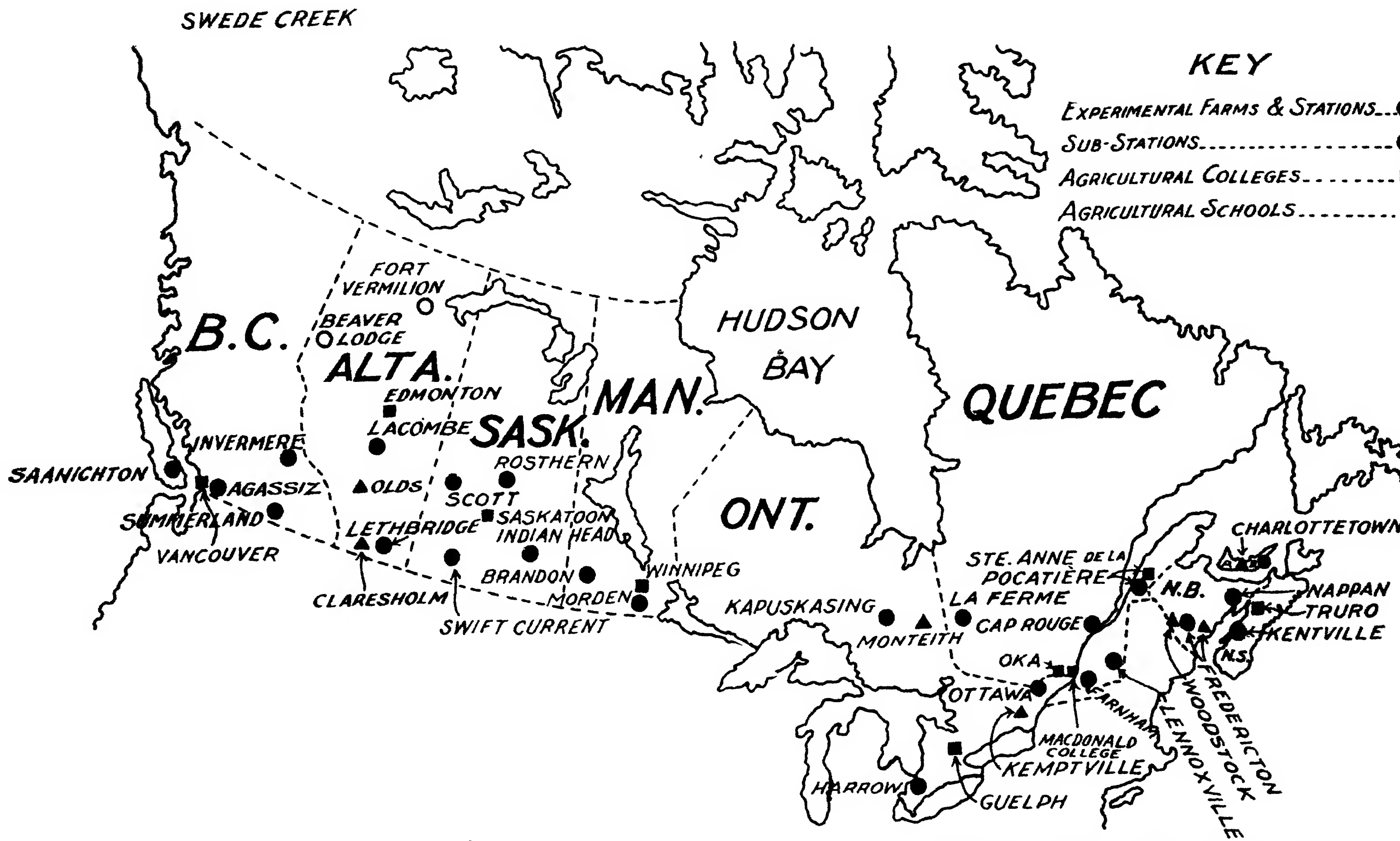
DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 11: No. 2 March-April, 1924

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA



MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART I

DOMINION DEPARTMENT OF AGRICULTURE

PART II

PROVINCIAL DEPARTMENTS OF AGRICULTURE

PART III

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

PART IV

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS PUBLICATIONS AND NOTES

PART V.

INTERNATIONAL INSTITUTE OF AGRICULTURE

The AGRICULTURAL GAZETTE OF CANADA

VOL. XI MARCH-APRIL, 1924 No. 2

DAIRY RESEARCH

THE establishment of a Research Division in the Dairy and Cold Storage Branch of the Dominion Department of Agriculture, marks the first attempt made in Canada to conduct systematic investigations looking to the solution of problems of bacterial or fungous origin in connection with the dairy industry.

While it is true that, during the last few years, some effort has been made through the Honorary Advisory Council for Scientific and Industrial Research to foster research in dairying, and while, in various Canadian Agricultural Colleges and Dairy Schools, some attention has been and is being given to test or experimental work, very little in the sense of pure research work is being undertaken. This omission is due so far as the Agricultural Colleges are concerned to onerous teaching schedules and to the lack of research professors and assistants on the college staffs.

Research is recognized as essential to progress and success in all great industries. Some of these support research laboratories employing hundreds of men. Many of these men, of course, work directly on practical problems; others work merely to extend human knowledge without any regard to its immediate application, but with the conviction that the facts ascertained will find their application, just as they have always done.

It is scarcely necessary to defend dairy research. Progress in dairying has always been impossible without something of the nature of research. In the United States, we find such organizations as the Department of Agriculture, Experiment Stations and Agricultural Colleges employing large staffs of research professors and assistants, with excellent laboratories and equipment, in an endeavour to advance the industry both scientifically and commercially. In Canada this is not the case. Owing to a peculiar condition, we have not been compelled to take up dairy research, but have accepted and used the findings and facts arrived at or ascertained in other countries. Canada, however, has been exceedingly well served in the way of practical instruction through the dairy schools and field workers, but the time has arrived when substantial improvement can come only with fuller scientific knowledge and its application to the industry.

Everyone engaged in dairying who has been suddenly confronted with a practical problem in connection, say, with the cause of mouldy butter, or the neutralization of cream for buttermaking, will realize how essential it is that there should be a reserve of fundamental knowledge which the maker can call to his assistance. The dairyman without a research department to fall back upon is not unlike a factory without a master mechanic.

Another justification for dairy research, if one be needed, is found in the fact that the dairy industry is

faced with a critical home market and with keen competition in the export market. The slogan of the Canadian dairyman of to-day is Quality, and this in itself should be an incentive to concentrate effort in the direction of research. Foreign researches are not in all cases applicable to Canadian conditions, and to offset this, the Dominion Department of Agriculture has made a beginning by the appointment of Dr. E. G. Hood as chief of the new Division of Dairy Research in the Dairy and Cold Storage Branch, where he will be at liberty to investigate the origin of many special and local problems as they arise, problems that can be dealt with only by the trained scientific investigator.

THE MEAT INDUSTRY OF CANADA

By P E Light, Markets Intelligence Service, Live Stock Branch.

THE production of live stock for meat is an essential part of Canadian agriculture, and represents one of the country's chief sources of revenue. In Canada, more so than in many other countries, the permanent financial well-being of the people is closely associated with the condition of the live stock industry on farm and range. Happily, soil, climate and the character of the people lend themselves admirably to the successful breeding and feeding of cattle, sheep and swine. The soils of Canada are extremely responsive to tillage, and produce coarse grains and fodder crops in an abundance and of a quality conducive to liberal and advantageous feeding. In addition, the natural grasses on range and pastures are luxuriant and strong, and the sown grasses and clovers strikingly productive. An outstanding factor in the live stock situation is the healthfulness of the climate, which promotes thriftiness, ruggedness and comparative freedom from disease. Under the influence of the vigorous winter climate, and the long bright summer days, all classes of stock are perpetuated under almost ideal conditions.

The make-up of the industry is distinctly British. It reflects a conservative adherence to certain well established breeds, and particularly as it concerns the production of beef, has behind it a long period of importations from Great Britain—a country famous as the home of the world's outstanding live stock families—dating from the beginning of the nineteenth century.

But the history of live stock on Canadian soil goes back to a much earlier period for we find that in 1667, at the beginning of the French régime, when the human population numbered less than 2,000 souls, the live stock holdings were estimated at 3,107 "horned cattle," 88 sheep and 1,000 swine. In the year 1699, the King of France, in despatches of instruction to the Governor of Quebec, then known as New France, demanded the stimulation of cattle rearing as a means whereby the colony might eventually supply beef for the needs of the troops in France.

Fifty years ago, the human population of the Dominion numbered but 3,689,257 people; to-day the population is about 8,769,000. Comparing the increase in human population with that in live stock, one will appreciate the rapidity at which Canada has developed her meat output. In 1871 there were approximately 2,624,000 cattle, 3,000,000 sheep and 1,334,000 hogs—a total of about 6,950,000 animals; and in 1923 there were 9,246,000 cattle, 2,750,000 sheep,

and 4,405,000 hogs—a total of about 16,401,000 animals, and an increase of well over 100 per cent.

The holdings of farm live stock in 1923, by provinces, is given by the Dominion Bureau of Statistics as follows:—

	Cattle No	Sheep No	Swine No
Prince Edward Island	130,578	83,933	42,011
Nova Scotia	271,048	258,537	44,034
New Brurswick.	212,901	157,808	66,182
Quebec	1,781,751	822 997	797,726
Ontario	2,838 087	907,673	1,734,734
Manitoba	691 711	93,162	291,236
Saskatchewan .	1,535,087	137 240	679,867
Alberta	1,520,924	239,174	706,681
British Columbia	264,144	53,336	42,845
Total	9 246,231	2 753 860	4,405 316

Value of Live Stock Holdings

The five year average value of the commercial live stock holdings in the Dominion from 1919 to 1923 inclusive, is approximately $659,000,000, of which amount $540,000,000 is credited to cattle, $37,000,000 to sheep and $82,000,000 to swine. During the last stages of the War, when prices were at the peak, the value of Canadian live stock was approximately $1,000,000,000.

Live Stock Exports

About the year 1880, an import demand for commercial live stock developed in Great Britain. The business was facilitated by the ocean steamship, which then became available for carrying cattle overseas. A strong business resulted in cattle and sheep with British feeders and with the British trade.

Although in the year 1871, not one head of stock had been shipped to Great Britain, in 1881, ten years later, 49,909 cattle and 80,222 sheep were brought in by British importers. In 1891, exports overseas amounted to 107,689 cattle and 299,347 sheep. In 1901, over 119,000 cattle were sold to Great Britain, and in 1911 approximately 114,000. The disrupting of trade, as a result of the World War, caused a diversion of live stock exports from Great Britain to the United States of America. From 1914 to 1922, the average of the annual exports of live cattle to the United States amounted to approximately 200,000 head. During the twelve months ended March 31, 1923, approximately 35,500 cattle were exported to Great Britain, and 217,480 to the United States.

The Modern Phase

The modern phase of the live stock industry supplies liberal material for a story of a notable development. Up to the beginning of the present century, the annual surplus of live stock was killed on the farm, or by local butchers, or exported direct from prairie and farm. Within the past twenty years public stock yards have susperseded both the local market and the individual exporter, and an organized packing industry has largely supplanted the slaughter of live stock at the place of origin. The gradual passing of the grazing range and the introduction of centralized marketing and meat packing followed closely on the heels of railroad development and extension.

The steadily growing industrial centres of the Dominion provided an expanding outlet for all sorts of food commodities, not the least among which were the products from the live stock industry. Centralized marketing and slaughtering developed as a matter of course. In the older provinces, such as Ontario and Quebec, the massing of population came about with considerable rapidity. Twenty years ago, Toronto on Lake Ontario had a population of about 200,000, it is now a city of 522,000 people. Montreal, on the St. Lawrence river, boasts a population of 712,000; Winnipeg, at the junction of the Assiniboine and Red Rivers, once Fort Garry, to-day is one

of the most modern cities of the New World, with a population of 191,908; Calgary's population is 63,305, and Edmonton's, 58,821. Vancouver, the leading port on the Pacific coast, comprises a population of 139,364. Other leading city populations are Hamilton, 114,151, Ottawa, 107,843, London, 60,959, and Quebec city, 95,193.

But perhaps the greatest impelling force behind the development of organized marketing and packing has been the exploitation of the British bacon market, requiring as it did the growing of a particular type of hog, bred, fed and cured with the requirements of the British market in view. How successful this project has been may be judged from bacon export statistics.

Commercial Herds

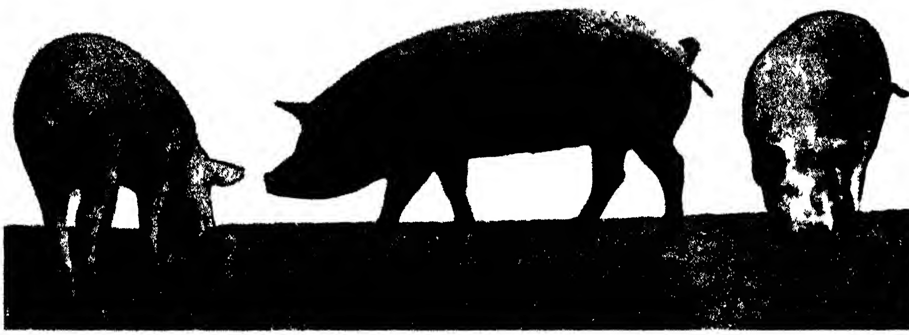
Cattle.—The commercial cattle herds have their modern foundation in well recognized Shorthorn, Aberdeen-Angus and Hereford families. This applies to the large herds on the western ranges, as well as to the smaller holdings in the mixed farming areas of the western provinces and Ontario and Quebec. These herds are maintained from year to year by introductions from the many pure bred herds to be found throughout the Dominion, and whose breed character and quality are maintained through frequent purchases from the best herds in the British Isles.

The removal in 1923 of the British embargo against Canadian store cattle provided the British trade with a first-hand opportunity to judge the quality of Canadian cattle, for in the last analysis, the steer is judged, not by his family connections, but on the basis of his carcase quality. From the verdict of the British feeder trade and consumer, it may be fairly inferred that no cattle respond better to feed and care than do those reared on the farms of the Dominion. This fact reflects credit on those breeders in Great Britain whose animals are the ancestors of the Canadian store and fat animal, and from whom Canadian importers are continually purchasing new blood for distribution within the Dominion.

The Canadian Departments of Agriculture, Federal and Provincial, are constantly seeking to promote a policy whereby the majority of Canadian cattle will be finished and marketed at around two years, rather than the production of heavy animals maintained for four or five years in stable and on grass, thereby increasing the supply of stock of the type and quality indicated by the needs of the British importer.

Sheep.—The sheep industry as a source of wool and meat supply is being given special attention at the present time. During the past year some very liberal importations were made of rams from noted British flocks, in order to stimulate breeding activity and augment the depleted supply of native bred sires arising from an active demand for improved blood. Canadian lamb sells readily and almost invariably commands a high price in foreign markets. Co-operative selling both of animal and wool, strict attention to docking, dipping and castrating, under Government arrangement, are factors that tend to promote the production of sheep on a gradually expanding scale. The sheep industry is recognized already as a most important adjunct to farming operations, and in view of the comparatively large acreage of grazing lands and the many exclusive areas that are useful almost solely for sheep production, the possibilities for the extension of the industry are considerable.

Bacon Hogs.—The production of hogs occupies an important place in Canadian agriculture. In fact, the growing of pigs for Wiltshire bacon



Yorkshire Hogs of the type size and weight aimed at for Canada's Bacon Trade

Tamworth Hog of the type for making Select Export Bacon

production is one of the most valuable single enterprises in the farming industry. No other line of production is receiving more definite direction, nor is there any other line of breeding and feeding where more strict attention is being given to the exacting requirements of the market.

By volume, Canada occupies third position as contributor to Great Britain's bacon requirements. As regards quality, it may be definitely stated that no bacon has shown more improvement in general quality during the past few years than the Canadian product. This improvement has been brought about largely through the operation of a policy whereby all hogs sold for slaughter are subject to official grading. All stock graded as of "select bacon" type is entitled to a ten per cent premium over the "thick smooth" hogs of equal weight, namely, from 160 to 210 pounds at market.

Since this policy became operative, there has been a marked improvement in the percentage of hogs considered suitable for the best export trade. The consequent demand for bacon type boars and brood sows at the present time exceeds the supply, and during 1923, liberal importations of boars from outstanding British herds were made by Canadian breeders.

Yorkshire breeding predominates in the bacon breeds, although Tamworths and Berkshires, all of improved strains, are prominent.

Canada's swine industry represents the only important source of colonial bacon supply for the United Kingdom. The Canadian Government, in co-operation with the producer and the trade, is sparing no effort to so improve the quality and reliability of the supply, with the probability that, within a few years, the Empire will be more or less self sustaining in the matter of bacon requirements.

Government Aid

The Canadian Government, through the Live Stock Branch of the Dominion Department of Agriculture, spends over $1,250,000 annually in the direct stimulation of production of commercial types of live stock. The Federal policies in this connection include grants to fat stock shows and summer fairs so as to provide adequate money prizes for recognized classes in cattle, sheep and swine.

Improvement in beef cattle production is stimulated through the lending of pure-bred bulls to specially formed farmers' organizations. The value of the bulls placed with these associations to date approximates $600,000. At present, about 1,500 bulls valued at $300,000 are on loan.

The encouragement of the use of well-selected sires, and the provision of an agency through which farmers may procure such sires at the least trouble and overhead expense, are features of the activities of the department. Under this policy, orders are filled for bulls, boars and rams. Farmers not in touch with breeders are thus enabled to secure high quality stock, with the assurance of expert selection.

The Dominion Department, in cooperation with the provincial departments, has been for some years actively engaged in a "scrub-bull" elimination campaign. Through lectures, printed publicity and demonstrations, producers are persuaded to get rid of all sires of poor breeding and to substitute selected bulls, purchasable through government experts. Exchange stables have been operated at central points, and special live stock trains have been run through various parts of the country for demonstration purposes and for the sale of pure-bred stock.

To encourage winter feeding and summer finishing of live stock, and as well to prevent the premature

slaughter of certain classes, the department undertakes to pay the travelling expenses of farmers who desire to purchase stock on the public stock yards. This policy covers cattle, sheep and swine. Up to date, over 79,000 bullocks, 75,000 heifers and 43,000 sheep have been shipped back to country points under this policy.

Where farmers are desirous of purchasing useful breeding heifers, young ewes and young sows, as offered for sale at public stock yards and destined for slaughter, the department pays the carriage charges on the stock, provided the purchases are not made as a speculation. Under this policy, which preserves potential breeding stock from untimely slaughter and, as well, acts as a stimulus to the industry, over 96,000 heifers, 93,000 young ewes and 800 sows have been shipped back to farms.

Boys' breeding clubs have been put into operation, with the object of stimulating juvenile interest in good live stock, thus tending to develop efficient live stock farmers.

The sheep industry is promoted through the application of a number of policies, the object of which is to popularize good breeding sires, and to increase the output of choice meat lambs. Ram clubs are a medium for introducing pure-bred rams in districts where the sheep industry is backward. The Ram Premium Policy aids those purchasing pure-bred rams for the first time. Two annual premiums of five dollars each are paid to farmers who will dock and castrate the offspring of these pure-bred sires. The department undertakes to grade rams for those who are not well acquainted with the requirements of a flock leader. This policy tends to eliminate scrub sires.

Officers of the department encourage the practice of docking, dipping and castrating. Approximately 500 demonstrations are given each year,

Group of Canadian market lambs from car lot winning Grand Championship at International Live Stock Exposition, Chicago, Ill.

attended by about 70,000 people. About 18,000 sheep are dipped by the department's demonstrators.

Sheep feeding competitions are held through the combined efforts of the Dominion and Provincial Departments of Agriculture. Thirty-three competitions of this kind were held in Quebec province last year. Instruction is given in improved feeding methods and in the culling of flocks. Lamb shows and sales are also organized.

Boars are lent to specially formed associations of farmers, as well as to junior pig clubs, in districts where pure-bred sires are not available. Competitions in judging are promoted through liberal money grants to be used as prizes.

THE OUTLOOK FOR DAIRYING

By J. A RUDDICK, Dominion Dairy Commissioner

THE future of dairying, like the future of any other business, is never very clearly revealed. but there are always some aspects of it that can be referred to with more or less confidence. For instance, there can be no doubt that there is a great increase in dairy production in many parts of the world, and especially in the southern hemisphere.

In this connection, I may point out that in 1914 the northern hemisphere supplied 79 per cent of the butter imported into the United Kingdom, and only 21 per cent came from the southern hemisphere. In 1923, only 44 per cent was from the northern hemisphere, and 56 per cent from the southern hemisphere. In the case of cheese, 60 per cent came from the northern hemisphere in 1914, and only 41 per cent in 1923. These figures and percentages are for the first nine months of each year mentioned. If we go back 20 years, we find that only 2 per cent of the cheese and 7 per cent of the butter came from south of the equator at that time.

The change that has come over the world's production in recent years whereby the southern hemisphere is now exporting more than the northern hemisphere, has upset the old methods of trading and basis of calculation to a very large extent. At one time practically all the butter and cheese consumed by the importing countries was produced in seven or eight months of the year, or during the northern summer. At the present time, there is a more uniform production throughout the year, but if anything, more butter and cheese is now produced for export during the period of the year than less than 20 years ago was looked upon as the non-producing season.

Not only is the southern hemisphere, including countries like New Zealand, the Argentine and South Africa, showing much activity in dairy production, but some of the continental European countries are coming back to pre-war conditions and even exceeding them in some cases. This is particularly true of the new Baltic States, formerly a part of the Russian Empire. Finland, Esthonia, Latvia and Lithuania, which take in most of the country on the Russian side of the Baltic, are making substantial progress in the development of the dairy industry, and their exports are now a factor on the British market. It is estimated that it will be at least ten years before there is a revival of the export of butter from Siberia, which amounted to about 118,000,000 pounds in 1914.

With all this activity in dairy production in different parts of the

world, the situation would be rather disconcerting if it were the only form of activity that has a bearing on the question. It is a fortunate circumstance that concurrent with increase in production, there is a great impetus being given to increased consumption by the newer knowledge of nutrition, and the active propaganda for a greater use of milk and its products in the diet of the human race, and especially the younger element. Those who attended the recent World's Dairy Conference at Washington, Philadelphia and Syracuse, must surely have been impressed with the prominence given to health and nutritional topics. The reading of papers at one session by four of the world's leading nutritional experts, all of whom advocated a greater use of milk, was a fact of enormous importance to the industry. Indeed the Congress was almost as much of a health and nutrition event as it was a gathering in the interests of pure dairying.

Already there are signs that the United Kingdom, the great world's market for dairy produce, is consuming increased quantities of butter and cheese. During the eleven months ended November last, the imports of butter were 533,869,280 pounds as against 409,577,056 pounds for the same period in 1914. This increase of 124,000,000 pounds is partly due to the fact that since April 1923 Irish butter has been included in the imports. The imports of cheese during the 11 months ended November 1923 were 293,209,168 pounds as against 248,142,384 pounds for the same period in 1914.

Although there is undoubtedly a large increase in production in some parts of the world, the increase in consumption seems to be keeping pace with it. Undoubtedly competition is growing keener every day, but I see no reason to believe that Canada will not be able to find a market for all her surplus dairy produce if the quality is right.

The United States Market

So much interest has been shown during the past year in the United States as a possible market for our butter and cheese that a few facts concerning this outlet will be of interest.

The total imports into, and exports from the United States for ten months ended October last, were as follows:

	Imports:	Exports:
Butter	16,871 648 lbs.	4,940,509 lbs.
Cheese	49,240 463 "	7,696,420 "

The net imports were 11,931,039 pounds of butter and 41,544,043 pounds of cheese. Before the war the annual importation of cheese into the United States was about 60,000,000 pounds. They are now making more of the fancy varieties which they used to import. Our share of the United States trade for the same period is shown by the following figures:

	Exported to U.S.	Imported from U.S.
Butter	3,174,138 lbs	631,832 lbs.
Cheese	2,875,800 "	697,150 "

Our net export to the United States was, therefore, 2,542,306 pounds of butter and 2,178,650 pounds of cheese.

The view that the United States is to become a large importing country, even to the extent of eventually being capable of absorbing our total surplus, is not without supporters. It must be borne in mind, however, that the present high duty was imposed with the object of raising prices, and it seems to me that the premium now being received by United States producers over world's prices will encourage production sufficiently to overtake consumption before long, and that we shall have to continue to look to the United Kingdom as our chief permanent market.

EUROPEAN CORN BORER IN ONTARIO IN 1923

Spread and Degree of Infestation

By W. N. KEENAN, Division of Foreign Pests Suppression, Entomological Branch

THE first year, 1920, that the corn borer was discovered in Ontario, thirty-five townships were found infested, covering an area of 2,780 square miles. In 1921, seventy-one additional townships were added to the quarantine; in 1922, forty-five more were infested and eleven were included in the quarantined territory on account of their situation. The area under quarantine in Ontario at the beginning of the season of 1923, totalled 12,616 square miles, as compared with 13,857 square miles similarly affected in the various infested portions of the United States.

In 1923, scouting of the border territory was again carried on during the months of August and September. All the corn growing townships between Lake Huron, Georgian Bay and Lake Simcoe were examined, as well as the remaining unquarantined townships of the counties of York, Ontario, Durham, Victoria, Northumberland, Peterborough, and Prince Edward. On account of the possibility of water distribution, all the shore townships along the St. Lawrence river, as far down as Cornwall, were inspected and portions of the county of Carleton were also scouted.

As a result of the above inspection only eight additional townships were found to be infested; one in Huron county, three in Bruce, two in Wellington, one in York and one in Durham county. All of the above townships adjoin the quarantined territory with the exception of Saugeen and Kincardine in Bruce county. The Saugeen township infestation represents the most northern point of infestation in Canada, and in this connection it is interesting to note that several hills of corn were found infested in the field, whereas at the other points discovered this year, only isolated stalks were found infested. The northern spread along Lake Huron again demonstrates the relative importance of lake shore conditions in corn borer distribution, and an effort will be made to watch the development of the pest in the township of Saugeen.

Possibilities of Further Spread

From the viewpoint of food supply, it is, of course, possible that the European Corn Borer may spread over a much larger area in the province of Ontario than it covers at the present time. The reports of the foremen of the scouting parties, who worked Grey county in the past two seasons, would indicate that the interior of this county does not grow corn to any extent. Dufferin county is also unimportant as well as northern and western Simcoe county in general. Northern Ontario county, Victoria county and northern Peterborough county may be similarly classified, but corn is a sufficiently important crop in various other uninfested sections of the province to warrant efforts being made to retard the spread. An important portion of Wellington county is still uninfested, a large amount of corn is grown in the shore townships of Lake Simcoe, the townships bordering the quarantined territory in the counties of York, Ontario, Durham, Northumberland, southern Peterboro', and Prince Edward usually grow a large acreage of corn, and the townships along the St Lawrence river would supply a sufficient amount of corn to favour the development of an outbreak. The counties of Glengarry, Prescott and Russell are somewhat important. The county of Lanark grows about 11,000 acres, and the county of Carleton

ranks fifth in importance in the province in silage corn production, with about 18,000 acres.

Degrees of Infestation

With the exception of a limited area in the centre of the infestation, where accurate records were made by Messrs. Crawford and Spencer during the investigational work, no special effort was attempted until last year to record the actual degree of infestation in the older portions of the infested territory. The work in this connection last season was carried on after the completion of the border scouting in late September. Observations were made at various points in three concentric circles surrounding Union Village, the centre of the infestation. On account of the small staff available and the fact that the corn was then being cut, the records were taken from only one field at each locality. An effort was made to locate the most heavily infested field at each point, and the degree of infestation was obtained from 300 representative stalks together with relating data regarding the history of the field. This method did not show the average conditions, but substantiated the original decision regarding the centre of the outbreak and verified established opinions concerning the benefit of late planting.

In 1923, a definite system of recording the development of the infestation was inaugurated with the intention of continuing the work for several seasons to supply accurate information regarding the importance of the pest under the varied soil and crop conditions encountered in the large territory affected and to locate local outbreaks. Definite points in approximately the same three circles as used last year were chosen, and include the counties of Elgin and Middlesex and the western parts of Oxford and Norfolk. In addition, various points in the counties of Essex, Huron, Perth, Oxford, Welland, and Lincoln have been included in this season' records.

The method of crop handling and climatic conditions are apparently very favourable for the corn borer in a large proportion of the infested territory. In 1920, the first year of discovery, accurate infestation records were taken from only a small area, due to the late date at which investigational work was started. One field near Port Stanley showed 99 per cent of stalks infested. Ten miles west, the heaviest infestation to be found was one per cent, and beyond that the degree diminished rapidly. The north and northeastern spread were somewhat greater than the above and New Sarum, about ten miles from Union, showed approximately five per cent stalk infestation. A marked increase occurred in all sections in the central area in 1921 and, as noted above, the infested territory extended to sixty-five additional townships.

In 1922, 100 per cent stalk infestation was very common near the control area, and in the records taken on the inner concentric circle, within a radius of six to eight miles from Union, the per cent stalk infestation varied from 10·6 per cent on the northeast and 90·3 per cent on the west to 100 per cent on the east. The second circle radiating about fifteen miles from Union, showed degrees of infestation varying from 7 per cent to 77 per cent, the highest occurring on the west, in Dunwich township. The third circle, covering localities within a radius of thirty miles of Union, showed infestations ranging from zero to 6 per cent, the highest being on the west, in Aldborough township.

As stated previously, our 1923 records were obtained in a different manner from those of 1922. It is possible that individual fields between the record points would show a greater degree of infestation than

any of those studied. Nevertheless the survey will represent, as near as possible, the average intensity of infestation. The season's circle records cannot be compared accurately with last year's, but they will serve as a basis for standard records in future seasons.

In obtaining the 1923 records, the five nearest fields to a definite "cross road" point were examined. One hundred stalks were examined from three different parts of the field, in the case of the records from the three circles. One thousand stalks were examined from various parts of the fields concerned at the several points in the other counties. The following is a summary of the conditions noted:—

Area	Highest Percent Infestation	Lowest Percent Infestation	Average Percent Infestation	Total Fields Examined
Circle No. 1 (6-8 miles)	68.0	4.33	30.16	55
" No. 2 (15 miles)	47.0	0.0	16.97	80
" No. 3 (30 miles)	7.66	0.0	1.93	135
Essex County (80-110 miles)	13.66	0.0	1.31	48
Huron County (50-70 miles)	1.4	0.0	0.3	12
Lincoln County (95-115 miles)	0.6	0.0	0.2	15
Norfolk County (east) (45 miles)	1.2	0.0	0.32	5
Oxford County (40-45 miles)	2.8	0.0	0.93	15
Perth County (50-60 miles)	1.3	0.1	0.57	10
Welland County (95-115 miles)	4.4	0.0	1.06	45

NOTE.—Mileage stated represents distance from Union village, the centre of infestation. Wellard county first found infestation in 1920 and apparently a separate infestation.

In comparing the season's records of circle No. 3 with those of 1922, a very marked increase is evident, especially in a north and northeast direct on and in the districts near the lake on both the eastern and western edges. The increase, in the outside circle, is also demonstrated by the fact that the average infestation in the 135 fields in the outside circle is now 1.93 per cent, whereas two and three years ago our inspectors had to search the majority of the field in most cases to find an infested stalk.

In 1923 a careful consecutive field examination, chiefly in the counties of Elgin and Middlesex, was carried on under the direction of Professor Caesar, Provincial Entomologist of Ontario. Records were taken from every field along the main road running south to north between Union and Lucan, a distance of thirty-five miles, and also west to east between St. Thomas and Delhi, a distance of thirty-six miles. The following is a summary of the results:—

District	Distance	Average Infestation	Number Fields Examined
	miles	per cent	
North and South Records			
Union—St. Thomas	5	25.9	30
St. Thomas north	5	26.2	26
St. Thomas—north 5-10 miles	5	18.3	22
St. Thomas—north 10-15 miles (London)	5	21.5	16
Vicinity of London		20.8	16
London north	5	6.1	20
London north 5-10 miles	5	1.6	9
London—north 10-16 miles	6.7	1.6	8
East and West Records—			
St. Thomas—New Sarum	5	25.9	18
New Sarum—Aylmer	6	26.5	31
Aylmer—east	8	19.1	36
East to Tilsonburg	8	12.8	6
Tilsonburg—east	5	2.1	10
East to Delhi	5	1.6	12

As Essex county is the greatest corn-growing county of the province, with a corn acreage of 80,000 acres, the conditions there will naturally be of interest. Mersea township was found infested in 1921 and infested stalks were difficult to locate. The remainder of the county was scouted but nothing was found. In 1922, col-

lections were made in each remaining township. Many fields of corn were examined in the central and northern townships before larvæ were discovered, but in the southern townships collections were more easily made, although the infestation was extremely light. Our records in Essex county last season show a decided increase. Standard records were taken from five fields at eight points in the shore townships and also at Pelee Island, the results of which are as follows:—

Township	Locality	Highest Percent Infestation	Lowest Percent Infestation	Average Percent Infestation
Mersea	Hillman	5·5	2·2	3·48
Gosfield S	Ruthven	1·2	0·3	0·86
——	Arner	0·4	0·0	0·14
Colchester S	Oxley	0·8	0·0	0·34
"	Harrow	0·4	0·2	0·28
"	Marshfield	0·9	0·0	0·42
Malden	Comet	0·9	0·0	0·42
"	Malden Centre	0·6	0·0	0·3
Pelee Is	Misc. (8 fields)	13·66	0·33	5·89

Pelee Island was found infested in 1921. The degree of infestation was very low at that time. In 1922, the Pelee Island conditions were not studied, but the survey of 1923 showed a remarkable increase, and the infestation was much more intense than that of the neighbouring mainland.

The infestation in Welland county, first found in 1920, is increasing, but much more slowly than in the western territory. The results of the records in the other counties listed also indicate an increase, although an exact degree of comparison is impossible, owing to the lack of necessary information.

In reference to the 1923 increase, in territory near the centre of the outbreak, it has been most important to the north and east. The relation of the corn borer to the corn-canning industry in general has always been regarded with anxiety. This recent development is unfortunate in that it has affected canning-corn crops in the Aylmer region very seriously. The infestation in all other canning districts is as yet comparatively light.

In 1920, the degree of infestation in the districts from which the Aylmer canning factory received its corn supply would average five to ten per cent stalk infestation. In 1921 various canning corn fields ran from 21 per cent to 74 per cent ear infestation. In 1922 the factory refused material with ten per cent ear infestation, with the result that corn was refused from one or two fields and two loads from other fields were turned back. This year the situation became serious. Corn delivered to the factory by twenty-two growers on September 4 was examined. Notwithstanding the fact that practically all growers had already culled from five to thirty per cent in the field, the corn presented to the factory varied in ear infestation from six to fifty-six per cent, and from two to forty-three per cent of the cobs showed actual feeding. As a result of this condition, a special control campaign was started in the district under the personal direction of Professor L. Caesar, Provincial Entomologist.

The European corn borer has already established its importance as a serious corn-crop pest in approximately one thousand square miles of territory in Ontario. In Massachusetts, it is causing serious financial losses, through infestation in other crops, in addition to corn, and the

development of similar conditions in portions of the Ontario infested area is regarded as possible.

Greater efforts were made this season in the enforcement of the quarantine which gave further assurance of the importance of infested table corn transportation as a means of spread. One phase of the quarantine work consisted of automobile inspection. During the week-ends a total of 1,434 automobiles were held up at different points on the quarantine border and ninety dozen ears were seized. Seventeen ears were found infested.

In 1921, the township of Pickering in Ontario county was found to be infested, and in 1922 a collection of the borer was taken in Brighton township, Northumberland county. These outbreaks were situated some distance from the nearest infestation discovered in the years mentioned, and were very probably due to the movement of infested material. The difficulty of teaching control methods and the financial outlay involved is naturally associated with the size of the infested territory, and the extent of crop losses is likewise similarly affected. A large corn-growing acreage in Ontario is still uninfested and southwestern Quebec grows corn abundantly. It is therefore necessary to expend every effort possible to prevent the artificial spread of the pest to new districts, by means of strict quarantine enforcement.

DOMINION EDUCATIONAL CHEESE AND BUTTER SCORING CONTESTS, 1923

By GEO. H BARR

THE year 1923 witnessed the holding of the first Dominion Educational Cheese Scoring Contest. The contest was open to a limited number of factories per month in each province and covered the period May to October inclusive. The provincial dairy authorities named the factories participating in the contest. The rules called for the entry of one cheese from each factory. It was stipulated that different factories should be named each month, and that the cheese should be made between the 1st and 10th of the month. Only fifty-six factories entered the contest, although the monthly quota from the provinces entering was as follows: Ontario 4; Quebec 4; New Brunswick 1; P.E. Island 1; Alberta 1.

Upon arrival in Montreal, the cheese was placed in cold storage at a temperature of 36 to 38 degrees F., and scored a few days later.

The following is a detailed report of the contest:

NUMBER OF SAMPLES IN EACH GRADE BY PROVINCES

Province	Total Samples	Special Grade	First Grade	Second Grade
Ontario	22	4	17	1
Quebec	21	9	9	3
Alberta	3	.....	1	2
New Brunswick	6	....	4	2
P. E. Island	4		4	
Total	56	13	35	8

PERCENTAGE OF SAMPLES BY GRADE

Special Grade	23·22	per cent
First Grade	62·50	"
Second Grade	14·28	"

AVERAGE SCORE FOR FLAVOUR AND TOTAL SCORE BY PROVINCES

Province	Number of Samples	Average Score for Flavour	Average Total Score
Quebec	21	40·25	94·66
Ontario	22	40·07	94·27
P. E. Island	4	39·37	93·62
New Brunswick	6	38·61	92·95
Alberta	3	38·50	92·06

STANDING FOR WORKMANSHIP BY PROVINCES (Based on the Score for Texture, Closeness, Colour Finish Total 55 points)

Province	Average Scores	No of Samples
Quebec	54 42	21
New Brunswick	54 33	6
P E Island	53 25	4
Ontario	54 21	23
Alberta	53 57	3

RESCORES FOR FLAVOUR

The following table shows the average of the scores for flavour on the samples from each province in May, June, July and August and the average of the rescores in these samples when they were two months old:

Province	Average Scores	Average of Rescores	Difference
Ontario	40 03	39 68	0 35
Quebec	39 68	39 73	0 18
New Brunswick	38 87	38 00	0 87
P E Island	39 50	39 33	0 17
Alberta	38 25	38 50	+0 25

The following table shows the average of the scores for flavour on the May and June samples and the average of the rescores when the samples were four months old

Province	Average Scores	Average of Rescores	Difference
Ontario	39 85	39 57	0 28
Quebec	39 70	39 60	0 10
New Brunswick	38 75	38 00	0 75
Alberta	38 25	39 00	+0 75
P E Island	39 50	38 00	1 50

THE BUTTER SCORING CONTEST

The Dominion Educational Butter Scoring Contest has been carried on each year since 1919; the principal object of the contest being to establish a uniform type and quality of creamery butter throughout the Dominion. The creameries participating each year were selected by the provincial dairy authorities The samples were shipped to Montreal, placed in cold storage and scored a few days after arrival The result of five year's work cannot be described better than by stating that in the month of October, 1923, a 14 pound box of butter was sent from each of the nine provinces and every box was placed in Special grade This, together with the fact that in the 1923 contest the number of Special grade samples was 23 4 per cent greater than in 1922 and 50 65 per cent greater than in 1920, proves that the creamery butter makers of Canada have improved their methods of making butter to a very remarkable extent during the past five years

An effort is made to place in the hands of every creamery manager in Canada a copy of the churning record of every sample of butter sent to the contest and the above mentioned results are due very largely to the buttermakers following the methods used in making the highest scoring butter

In the 1923 contest which covered the six months from May to October inclusive, 49 creameries participated as follows Prince Edward Island, 3, British Columbia and New Brunswick 5 each, Alberta Saskatchewan Manitoba, Ontario Quebec and Nova Scotia 6 each

NUMBER OF SAMPLES IN EACH GRADE BY PROVINCES

Province	Total Samples	Special Grade	First Grade	Second Grade
British Columbia	5	2	3	
Alberta	6	4	2	
Saskatchewan	6	5	1	
Manitoba	6	6		
Ontario	6	4	2	
Quebec	6	5		1
New Brunswick	5	3	2	
Nova Scotia	6	6		
P E Island	3	1	1	1
	49	36	11	2

73638—2½

PERCENTAGE OF SAMPLES BY GRADE

Special Grade	73·47 per cent
First Grade	22·45 "
Second Grade	4·08 "

AVERAGE SCORE FOR FLAVOUR AND TOTAL SCORE, BY PROVINCES

Province	Number of Samples	Average Score for Flavour	Average Total Score
Manitoba	6	42·21	97·01
Nova Scotia	6	42·08	96·88
Quebec	6	41·25	96·10
Saskatchewan	6	41·51	95·90
Alberta	6	41·05	95·30
Ontario	6	41·55	95·23
New Brunswick	5	40·70	95·20
British Columbia	5	40·00	94·54
P. E. Island	3	40·00	94·46

STANDING FOR WORKMANSHIP, BY PROVINCES (Based on the Scores for Texture, Incorporation of Moisture, Colour, Salting and Packing. Total 55 points.)

Province	Average of Scores	No. of Samples
Quebec	54·85	6
Manitoba	54·80	6
Nova Scotia	54·80	6
British Columbia	54·63	5
New Brunswick	54·50	5
P. E. Island	54·46	3
Saskatchewan	54·38	6
Alberta	54·25	6
Ontario	53·68	6

RESCORES FOR FLAVOUR

The following table shows the average of the scores for flavour on the samples from each province in May, June, July and August and the average of the rescores on these samples when they were two months old:—

Province	Average Scores	Average of Rescores	Difference
British Columbia	40·00	39·33	0·67
Alberta	41·37	40·30	1·07
Saskatchewan	41·80	40·12	1·68
Manitoba	41·82	41·12	0·70
Ontario	41·40	39·62	1·78
Quebec	40·80	40·12	0·68
New Brunswick	40·62	39·00	1·62
Nova Scotia	42·12	40·62	1·50
P. E. Island	38·90	38·50	0·40

NOTE.—The score for P. E. Island is on the May and June samples only.

The following table shows the average of the scores for flavour on the May and June samples and the average of the rescores when the samples were four months old:—

Province	Average Scores	Average of Rescores	Difference
British Columbia	39·50	39·75	+0·25
Alberta	41·25	39·50	1·75
Saskatchewan	42·15	40·00	2·15
Manitoba	41·65	40·00	1·65
Ontario	41·30	39·00	2·30
Quebec	42·00	40·50	1·50
New Brunswick	41·25	39·00	2·25
Nova Scotia	42·75	41·25	1·50
P. E. Island	38·90	37·25	1·65

COW TESTING RESULTS

IN studying Canadian herd records for the past four years, it is encouraging to note that there have been some substantial increases in the average milk and fat production of herds that have been tested regularly. Not all tested herds have shown increased production during this time; but where no improvement is in evidence, the inference is that the owners failed to make use of the information available.

The following table shows the gain in average production in a number of herds where improvement has taken place:

Herd No.	Province	Average Production 1919 Milk	1919 Fat	1922 Milk	1922 Fat
		lbs.	lbs.	lbs.	lbs.
1	P. E. Island	5,990	217·6	7,884	280·1
2	P. E. Island	7,146	252·9	10,218	349·0
3	New Brunswick	4,197	219·6	5,527	275·9
4	Nova Scotia	4,044	169·1	5,554	234·7
5	Quebec	6,682	254·2	8,164	320·3
6	Quebec	5,240	199·4	7,067	264·1
7	Ontario	6,432	218·0	10,285	346·4
8	Alberta	4,593	168·2	8,359	254·6

THE BRITISH EMPIRE EXHIBITION

THE Experimental Farms Branch of the Dominion Department of Agriculture will be represented at the British Empire Exhibition by a model Experimental Farm surrounded by typical scenic work. The space occupied will be 40 by 60 feet. The model will be to scale, and complete as to buildings, fences, roads, shelter belts, rotation fields, experimental plots, live stock, and horticultural sections. A display will be made of sheaves of grains, forage crops, fruits, etc., originated, improved or introduced by the Branch. Transparencies, pictorial and otherwise, will give further information as to the services rendered, and a booklet will be distributed for the information of prospective settlers and others.

The exhibit to be made by the Dominion Live Stock Branch will occupy a space of 128 feet long by eight feet deep. Canadian bacon will be featured in an attractive manner in co-operation with the Canadian Packers, who will keep the exhibit supplied with this commodity.

The stocker and feeder business will be presented by means of scenes showing (1) Cattle on Canadian summer pastures, (2) Cattle on the western range in winter, and (3) Canadian cattle after their transfer to British pastures.

Displays will be made of Canadian poultry, eggs and wool. Canadian egg standards will be depicted, as well as the Canadian system of recording the performance of poultry. The wool and textile exhibit will include an exhibit of wool from the Prince of Wales' ranch in the Province of Alberta. Numerous transparencies will illustrate Canadian farm scenes and typical specimens of live stock.

The Seed Branch of the Department of Agriculture has collected an exhibit of seed from commercial sources and plant breeders to exhibit at the British Empire Exhibition for the purpose of showing this branch of Canadian industry and stimulating trade in the export of hardy, northern-grown Canadian seed within the Empire and to Northern European countries.

There have been secured for this exhibit the prize winning samples from national and international seed shows, including the championship wheat, oats and peas at the Chicago International, which were all Canadian-grown exhibits. The plant breeders have supplied samples of Elite stock seed representing the main kinds and varieties originated by them and those in process of improvement. From commercial sources, including the Canadian wholesale seed trade, larger exhibits have been secured showing high grades of cereal grains, alsike and other clovers, grasses, peas, beans and corn, representative of the qualities of this season's crop, and available for export in car lots.

Some 3,000 boxes of apples have been collected by the Fruit Branch to represent Canadian fruit at the exhibition. The display will be set up and maintained by the Exhibition Branch of the Department of Trade and Commerce.

OATS SCALPINGS STANDARDIZED

By GEORGE H. CLARK, Commissioner, Dominion Seed Branch

THE constantly growing demand for recleaned grain screenings is ample evidence that the lack of confidence in this material on the part of Canadian feeders is rapidly being outgrown. This condition is attributable to several factors -the Feeding Stuffs Act, which forces removal of deleterious weed seeds and of chaff and dust; the introduction into mills and elevators of improved grain and screenings cleaning machinery; the classification and standardization of screenings, and a wider recognition on the part of the trade that the proper cleaning and grading of this material is essential to the establishment of a ready and steady market.

There is one class of grain cleanings standardized by the Board of Grain Commissioners and sold under the name "Oats Scalpings" which has not yet found a wide market in Canada but which is increasing in popularity and demand as it becomes better known. The average sample weighs from 36 to 38 pounds per bushel and consists of from 50 per cent to 75 per cent of wild oats with a total of from 70 per cent to 90 per cent of wild and domestic oats combined. The remainder is made up of wheat, barley and other coarse grains recovered along with the oats and wild oats, in the process of cleaning the wheat. It is evident, therefore, that for utility purposes Oats Scalpings are comparable with the feed grades of oats.

The principal objections of feeders to screenings are the lack of uniformity as between different shipments and the danger of spreading noxious weeds. Oats Scalpings, however, vary but little in composition except in the proportion of oats to wild oats, any increase in the percentage of the former usually being balanced by a corresponding decrease in the percentage of the latter. Furthermore, unlike most other classes of screenings, oats scalping are practically free from fine weed seeds, hence excessively fine grinding, entailing high power and special machinery, is not so necessary as with the other classes. An additional advantage is that oats scalpings either whole or ground may be obtained at the flour-mills as well as from the elevator, particularly at those mills of larger capacity which are equipped with modern cleaning and grinding machinery.

FLOUR MILL BY PRODUCTS PROHIBITED IN MIXTURES

By GEO. H. CLARK, Seed Commissioner

THE application of the amendment to the Feeding Stuffs Act respecting the sale of flour mill by-products has given rise to considerable complaint from feed manufacturers and consequent difficulties to the Department of Agriculture in connection with the enforcement of the amendment since it became effective on October 1, 1923. The amendment was construed by the Department of Justice to prohibit the hitherto common and much complained of practice of adding screenings to bran, shorts and middlings, and further, to make illegal the use of any flour mill by-product from wheat in the manufacture of any mixed feed. Manufacturers engaged exclusively in the blending of commercial mixed feeds urged that this latter was an incorrect interpretation, and that, even if cor-

rect, such a provision was neither contemplated nor intended by Parliament and could not be applied without inflicting hardships on live stock and poultry feeders as well as on themselves.

In the circumstances it was deemed expedient and was agreed that, while no registrations would be granted for mixed feeds containing any of the flour mill by-products, a reasonable time would be allowed to manufacturers to dispose of stocks on hand, and for all affected to adjust themselves to this new situation.

Since this issue first arose, at which time opinions varied widely as to what application of the law was just and in the best interests of the live stock and poultry industries, considerable discussion on the subject has taken place. Contrary to the claims of the manufacturers on behalf of live stock and poultry feeders, opinions expressed and resolutions adopted by the latter indicate a strong feeling in favour of the law as it now reads. The viewpoint is urged that it is of first importance to live stock and poultry feeders that they be able to secure pure wheat by-products of standardized quality as provided for in the law, and they feel that the object of this provision would be prejudiced by allowing the use of wheat by-products in mixtures, since it would permit the common and wasteful practice of combining valuable wheat by-products with inferior materials to be sold as registered commercial feeds under attractive names.

Considering all the circumstances, the Department finds itself compelled to continue to refuse registration on mixed feeds containing flour mill by-products, and to take what action may be necessary to secure compliance with this provision of the law unless and until Parliament indicates that such an application is more far-reaching than was intended or is now considered necessary.

PART II

Provincial Departments of Agriculture

THREE YEARS OF FIELD HUSBANDRY PROGRESS IN SASKATCHEWAN

By MANLEY CHAMPLIN, Professor of Field Husbandry, University of Saskatchewan

THE three years 1921 to 1923 have been years of testing in the world at large. Those countries have succeeded best in this struggle for existence and for a return to happy conditions where the qualities known as self-reliance and individual initiative have been found to be still alive. And in those countries where self-reliance has been coupled with a desire to co-operate with one's fellow workers the signs of a successful and happy ending to the era of economic distress are already apparent.

In the qualities of self-reliance and the desire for helpful co-operation, Saskatchewan has not been found wanting. It has been my experience among the people with whom I have had the pleasure of dealing to find that the old self-reliant spirit is still alive, that the new generation is not all centering its attention upon the God of Jazz, nor the older generation upon the ogre of Despair.

To prove this I want to recount some of the things that have been done during the past three years in field husbandry, the basic industry of this province. Progress does not mean consummation, nor does going forward mean arriving at the goal, but nevertheless, progress is worth noting, if for no other reason than to encourage us and stimulate us toward better efforts.

Cropping Conditions in 1920

You all know the conditions that existed in the fall of 1920. The crops had been short for two years. This served to aggravate and emphasize a condition which had been suspected all along, namely, that the system of farming in vogue made no provision for maintaining soil fertility. No pains had been taken to leave a binder of fibre in the soil. The soil rose up in rebellion in the dry spring of 1920 in many districts and brought attention to itself in a most forcible manner.

When the price slumped in the fall of 1920, it served to emphasize the fact that cost of production had been unduly high. When signals of distress came from the terminals at Fort William because the dockage dumped into the lake in hugh quantities threatened to ruin the public health by contaminating the water supply, it brought home to us the fact that clean seed and clean land were still as important as they used to be.

When penniless harvest hands were supported during the winter out of the public treasury, it reminded us that there are bad features about a labour situation that requires large numbers of transients. And many things verified the belief that the system in use did not distribute the income from month to month or from year to year as it should be distributed.

Planning the Attack

Through the winter of 1920 and 1921, people in all parts of the province were considering these problems and seeking various solutions. Three lines of attack on the redoubtable fortresses surrounding these problems were suggested. Two of these were dependent upon the self-reliance and

initiative of the individual; the third required co-operation. The first line of attack consisted in strengthening and increasing the supply of good seed, thus getting help from the force of heredity and taking a step toward weed control. The second consisted in developing methods of growing crops which would enable them to be readily fitted into good crop rotations, thus distributing labour and income better and giving an opportunity to control weeds. The third consisted in organizing for the purpose of marketing products in a way that would insure receiving the real value for the product to be sold and at the same time, to give the consumer a more dependable service.

Strengthening the Seed Supply

While it cannot be said that all goals have been fully attained, the following facts demonstrate that progress has been made. In the effort to strengthen the seed supply, a very careful review of all available data was made and certain pedigreed strains, or superior varieties, were designated for distribution. These included Marquis, Sask. No. 7 wheat, Banner, Sask. No. 144 oats, and Prolific spring rye among the grains. Arctic, Sask. No. 439 sweet clover and Grimm Sask. No. 451 alfalfa among the leguminous crops. Will's Dakota White Flint and Will's Northwestern Dent among the corn varieties. There were a number of other sorts which were used to serve a well defined purpose in strengthening the seed supply. Several thousand pounds of seeds were distributed for 1921. In 1922 the amount increased to about 80,000, and in 1923 to nearly 115,000 pounds. These seeds were grown from hand picked stocks and in most cases were hand picked when shipped to co-operators. The prices for these seeds were fixed at a reasonable figure to enable the small oprator to get a start as well as the large one. It was felt that this practice was justified because of the increase in wealth that could be expected in the whole province as these seeds came into common use through multiplication.

In order to avoid the loss of this seed through the product being sold on the market and shipped away, a careful follow-up system was used. In the first place all purchasers of seed who lived in Saskatchewan or in nearby territory were enrolled as members of the Saskatchewan Field Husbandry Association. Through the co-operation of the Field Crops Branch of the Saskatchewan Department of Agriculture, it was possible to have most of these seed growers visited by representatives of that branch. The Department of Agriculture also assisted by providing funds for the appointment of a director of co-operative experiments who has made it his duty to visit and assist the growers in any way possible.

In addition to this assistance from the department at Regina, we have urged our co-operators to make use of the seed registration system provided by the Canadian Seed Growers' Association, which works in close harmony with the Dominion Seed Branch. As a result, the number of acres inspected for registration increased from about 4,000 in 1919, to about 20,000 in 1922 and over 16,000 in 1923. The decline between 1922 and 1923 is explained by the fact that the Dominion Seed Branch took over the work of field inspection in 1923 and changed the policy of inspecting small fields for registration. The new plan is to inspect only the fields of those who expect to have seed for sale. This cuts out all the people with small multiplying fields of first-generation seed and thus reduces the acreage inspected, although the actual acreage of eligible seeds is larger than ever. The quantity of seed pased by the inspectors for registration in 1923 amounts to 350,000 bushels and

represents over half a million dollars in value of the seed itself, to say nothing of the improved crop it will produce.

Progress Toward Crop Rotation

The only way to have crop rotation and participate in its manifold benefits is to have crops that will readily work into a good rotation, so planned that each crop in it will help put the land in condition for the succeeding crop. This means that we must have cultivated crops, legume crops and staple grain crops, and grasses are also useful. If we once get in the habit of growing crops of the various classes, crop rotation will come as surely as dawn follows darkness.

With this idea in mind, Saskatchewan farmers have been growing grain in rows, increasing their corn acreage and their fields of sweet clover. It is impossible to know just how extensively this movement has taken place. But from my correspondence and travel, I feel convinced that there were close to a fifth of a million acres of grain in rows, sown as a cultivated crop, and over 100,000 acres of corn in the year 1923. From 70 acres of grain in rows in 1920 to 200,000 in 1923 is real progress. From 16,000 acres of corn in 1920 to 100,000 in 1923 represents substantial gain. Thus the problem of finding a cultivated crop for our rotations is being solved.

Let us now examine into the state of affairs with regard to soil improving crops. Here it is a little more difficult to form even approximate estimates. Most of the farmers are taking hold of sweet clover, alfalfa, rye grass, and brome grass somewhat cautiously. This is as it should be. Many of the fields are small so that it is hard to guess the acreage. But my correspondence leads me to believe that there are at least 5,000 farmers trying sweet clover. The fields range in size from one to one hundred acres. Probably 20,000 acres is not too high a figure for the sweet clover. This premier soil binder and soil awakener is increasing in importance every year.

According to estimates of the statisticians at Ottawa, over four-fifths of a million acres were seeded to tame grass for pasture and hay in Saskatchewan in 1923. While this represents a decline of a fifth of a million acres since 1920, I am inclined not to regard this as retrogression. Doubtless, much of the grass sown in 1920 failed to make a stand and never came into bearing. Other fields have been ploughed up after having been down to grass a few years and have been worked into the rotation, which, after all, is just what we want. There are certain simple facts about securing a stand of grass which are not well enough known or understood and we have taken pains in hundreds of letters and scores of press articles to reiterate and repeat those precautions that are necessary to help insure success in seeding grass.

Alfalfa, the queen of forage crops, is still suffering in much the same way that most of our cities are suffering. It has not yet absorbed the effects of a premature boom, which it experienced in the days when everything else was booming. Many at that time attempted to grow alfalfa without taking the precaution to learn something about it first. They were not to be blamed for this as there was no source of accurate information about growing alfalfa on the prairies in those days. I can well remember that nearly everything I learned about alfalfa growing fifteen years ago had to be revised. It was based upon the experience of those who were growing the crop in mountain valleys rather than on the open prairie. Besides that, it was hard to get genuine, hardy seed. Hardy seed is still too expensive. Some who suc-

ceeded in producing a good stand destroyed it by pasturing or cutting too closely in the fall, thus taking away its winter protection. Despite all these setbacks, interest in alfalfa is awakening. Here and there people are trying it. They are asking questions about it, and a bulletin has been prepared, but not yet printed, giving up-to-date proven facts about alfalfa.

The sunflower crop has also come in for a share of attention. Dairymen especially have found it a valuable feed in the form of silage. These immigrant plants from Russia produce such an enormous total per acre that a few acres suffice for a large herd of cattle. The acreage has expanded from a few hundred in 1920 to nearly 4,000 in 1923.

Thus the province of Saskatchewan is working toward the crop rotation ideal. With enough cultivated crops and enough soil-improving crops to balance the grain crops, crop rotation will gradually come about.

Silos and Silage

With the increased acreage of corn and the advent of sunflowers has come a marked increase in interest in the silo as a means of preserving these crops in the form of succulent feed. In 1920 there were less than 100 silos in the province. By 1923 the number, including trench silos, had increased to several hundred, probably not less than 1,000. This, too, means progress, as the silo is regarded as a necessary part of the farm equipment of a well-rotated farm.

Co-operative Marketing

The progress that has been made toward co-operative marketing of the wheat crop through a voluntary pool is remarkable. When we consider the vast distances involved, the bad roads to be traversed, and the legal entanglements that had to be straightened out, the progress made is gratifying to say the least. It has become almost an axiom that farmers are so individualistic that they cannot co-operate to advantage. In Denmark, those who believed in this axiom have been forced to the conclusion that farmers after all are essentially the same as other folks and that they can and do co-operate to mutual advantage. In Saskatchewan we cannot point to the accomplished fact, but can show real, substantial progress toward co-operation in the marketing of our key product.

Conclusion

Self-reliance and individual initiative, coupled with a desire to co-operate, is each doing its part toward the solution of Saskatchewan's problems in field husbandry. Crop heredity is one of the forces that is coming to our aid, through a continuous improvement of the seed supply. Crop rotation is another tremendous power for good which will eventually be invoked and impressed into our service through the increasing acreages of cultivated and soil-improving crops.

Silos for the preservation of succulent feeds have increased by at least 1,000 per cent, and are rapidly becoming part of the equipment of the progressive farm.

The co-operative wheat pool has overcome many obstacles and stands to-day as a remarkable example of what can be done in a short time and as a disavowal of the long-credited opinion that farmers cannot co-operate.

Do these things smack of "The whisper of death"? Do they not rather demonstrate that, in so far as Saskatchewan is autonomous, that in so far as her destinies are within the control of the people who live upon her soil, Saskatchewan is living up to the meaning of her name and is "Swiftly Flowing," rapidly progressing toward better things in field husbandry, her basic industry.

BRITISH COLUMBIA POTATO SHOW AND EDUCATIONAL SEED EXHIBIT

By J. B. MUNRO, B S A , Soil and Crop Instructor

THE consistent increase in the number of entries at the British Columbia Potato Show from year to year indicates the steady progress of the potato industry as well as the keen interest that the growers are taking in their work in the Pacific Province. From a humble beginning three years ago, when eight potato entries were made, ninety-seven entries the next year and two hundred and seventy-three entries at the first actual potato show a year ago, the entries mounted up to a total of four hundred and four at the Second Annual Potato Show held in November, 1923, at Victoria, B.C. This increase is particularly gratifying in view of the fact that only certified seed potatoes were allowed in the seed classes, and the number of varieties in the commercial classes was considerably reduced.

The recent show was a complete success from the viewpoint of both the exhibitor and the spectator, and through the educational work, conferences, meetings and publicity given the industry during potato fair week, this branch of agriculture has received a decided impetus. The potato work being done in British Columbia is attracting the attention of those interested in potatoes, not only in this Province but in the Pacific Northwest States and in other provinces of Canada.

The Potato Show was held by authority of the Honourable E. D. Barrow, Minister of Agriculture, under the direction of Mr. Cecil Tice, Chief of the Soil and Crop Branch, with the assistance and co-operation of the Victoria Potato Growers' Association and Chamber of Commerce. The British Columbia Department of Agriculture is much indebted to the officials of Dominion Experimental Stations for their efforts on behalf of the Potato Show and the potato industry as a whole in this Province.

A comprehensive programme including addresses on potato growing and marketing problems, the production of quality field and garden seeds, and the organization of growers for purposes of controlled production and distribution was carried out. The speakers included Hon. E. D. Barrow, and Dr. D. Warnock, Deputy Minister of Agriculture, as well as the following authorities in their respective branches:

R. G. Newton, Supt., Dominion Experimental Farm, Invermere, " Experimental Work with Potatoes"; R. G. L. Clarke, Chief Dominion Fruit Inspector, Vancouver, " Root Vegetables Act as Applied to Potatoes"; P. W. Anketell-Jones, Chemainus, B.C., " How to Grow an Acre of Potatoes"; J. W. Eastham, Provincial Plant Pathologist, Vancouver, B.C., " Potato Diseases"; P. A. Boving, Professor of Agronomy, U.B.C., Vancouver, " Soils, Fertilizers and Rotations for Potatoes"; J. A. Grant, B.C. Markets Commissioner, Calgary, Alberta, " Marketing"; F. M. Clement, Dean of Agriculture, U.B.C., Vancouver, " Industrial Combination"; A. McMeans, Dominion Seed Inspector, Vancouver, " The Seed Situation in B.C."; J. Travis, Manager, United Seed Growers, Penticton, B.C. " Seed Production and Marketing"; W. C. Edmundson, Superintendent, Potato Experiment Station, Greeley, Colorado, " Seed Improvement".

The vast agricultural area of Central British Columbia was well represented by exhibits of potatoes from several districts along the line of the

British Columbia Potato Show — Part of the Certified Seed Exhibit

Canadian National Railways between Prince Rupert and Prince George. This section of the Province is being developed agriculturally and its possibilities were well presented by H. G. Perry, M.L.A., of Prince George, and Col. R. D. Davies, of the British Columbia Land Settlement Board, both of whom gave addresses at the potato and seed meetings. The educational exhibit of grains and field seeds sent in from this district by A. E. Richards of the Dominion Experimental Farms Branch, illustrated the agricultural possibilities of Central British Columbia.

Among the innovations at the recent fair were some features of educational value to the farmers. The potato grading demonstrations, conducted by Inspector Robert Murray of the Dominion Fruit Branch, gave a practical illustration of the method of grading commercial potatoes and emphasized the need of grading. The field, garden and flower seed exhibits placed by the United Seed Growers, the Department of Agronomy of the University of British Columbia, and by many individual seed producers, gave the visiting public a fair idea of what the Province is doing in the production of quality seeds. Sweet pea seeds were a feature of the flower seed section. The preparation of various potato dishes was demonstrated by a domestic science specialist, and was a center of attraction to housewives throughout the week. A potato judging competition for adults, as well as one for boys and girls, was staged, and many contestants took part. In the latter competitions the eight winners were girls.

Competition was strong in the district displays, there being eight districts represented by eight lots of potatoes from each district. The premier trophy, a challenge cup presented by the Farmers' Institute Advisory Board, was won by the Windermere Valley, showing Cambridge

Russet and Wee McGregor varieties. The Gordon Head district exhibit, composed of Sir Walter Raleigh potatoes, took second place, while Comox Valley was third with Burbank and Green Mountain varieties. The other five districts, while not winning prizes, made a favourable showing and closely followed the winners.

Six Women's Institute locals exhibited as Institutes, showing the potatoes grown by six members of each local. The Women's Institute not only organized and showed the product raised by their members but they provided the trophies allotted to this class.

As a result of winning the highest aggregate points in four specified classes, the Victoria Potato Growers' Association carried off the challenge cup presented by the Windermere Potato Growers' Association.

As an outcome of the several meetings and conferences held in connection with the Potato Show, two province-wide associations have been formed. One is an organization of the certified seed potato growers of the Province, which has elected provisional directors and has already commenced a campaign for the systematic organization of the seed potato industry throughout British Columbia. The other organization is for commercial potato growers and will be completed during the early months of 1924, in time, it is hoped, to greatly influence the distribution of the 1924 potato crop. The price of certified seed potatoes has been set for the coming year at a minimum of $50 per ton f.o.b. shipping point.

The climax of the week's activities was the banquet held the closing night of the fair presided over by Speaker F. A. Pauline of the Provincial Legislature, and attended by the Premier, Hon. John Oliver, Mr. W. J. Bowser, leader of the Opposition, and the Hon. E. D. Barrow, Minister of Agriculture. Addresses were given by the above named gentlemen and others. The presentation of trophies was made to the winners by the Honourable John Oliver.

PRODUCTION AND SALE OF HONEY IN THE PROVINCE OF QUEBEC

By C. VAILLANCOURT, Chief of the Apicultural Service, Department of Agriculture

THE annual production of honey in the Province of Quebec amounts to 3,500,000 pounds of extracted honey and 300,000 pounds of comb honey.

Some years ago the Quebec beekeepers formed The Beekeepers' Co-operative Association for the sale of their product. Part of the revenue of this association is used to advertise honey and to stimulate its consumption. The association lately amalgamated with the "Co-opérative Fédérée de Québec," and their product is now sold through the latter organization.

The members of the Beekeepers' Co-operative Association ship their product to warehouses in Montreal, Quebec and Three Rivers, where it is graded according to a grading system adopted by the association. There are five grades: white honey No. 1, white No. 2, clear amber, amber, and brown. Thus, honey is sold acording to quality.

The association has also adopted uniform packages for the domestic trade, and those who purchase honey in lithographed pails, bearing the mark of the Fédération Apicole de

Québec, are sure of having a pure product of a superior quality.

The following is a summary of the association's regulations: To be eligible for membership, one must produce at least 300 pounds of honey; belong to a beekeepers' association recognized by the Federation; pay an entrance tax of ten cents per hive with a minimum of $1.

In addition to the necessary expenses for the sale of honey, which amount to about one cent per pound, each member must pay to the association half a cent a pound on the honey sold through the Co-operative Association. This contribution is used for advertising purposes.

When the honey is shipped to the Co-operative, each member receives an advance of at least 40 per cent on the value of the shipment, based upon the average price. At the end of the year the proceeds of the sales are averaged and settlement is made for the balance to each member.

If the honey supplied by a member is not equal to the standard adopted by the association, or if any member should try to deceive the association in any way, the association may keep 75 per cent of the price of all the honey sold for that member, and if the Board of Directors so decide, the member may be suspended or permanently debarred from membership.

The results anticipated by the organization are being fully realized. Last year Quebec white honey sold for 13 and 14 cents per pound. An export trade has also been developed, but it is not our main object. We are especially endeavouring to develop our local market and already have reason to be proud of the results.

Any member of the association is at liberty to sell his own honey, if by so doing he can get a higher price than that offered by the association, but if the price is the same, the honey must be disposed of through the Association.

During the last two years, thousands of pamphlets on the use of honey in cooking were distributed, and other forms of advertising have been undertaken to promote demand for the product

MOTION PICTURES IN SASKATCHEWAN

AGRICULTURE being the basic industry of the province of Saskatchewan, it is only natural that the Department of Agriculture should make wide use of moving pictures in instruction work. They are used in all short course work carried on by agricultural representatives in the province and also by the Extension Department of the University of Saskatchewan in connection with the agricultural courses conducted during the winter at various points in the province. The films exhibited deal with practically all phases of agriculture. Among them are pictures illustrating the co-operative marketing of live stock, showing the progress of the animals from the farm to the stockyards, the care of poultry and the candling of eggs, the construction of trench silos, cream grading, the embryology of an egg Films showing the good points of horses, bulls, milch cows, give the observant an education in what to look for when selecting these animals. Farm boys get a lot of useful information from films of this character, and put it to good use at the farm boys' camps when the live stock judging competitions are in progress. A combination of the practical and aesthetic is found in the film showing the proper method of tree planting, with the object of demonstrating how farm surroundings can be made more attractive.

BRITISH COLUMBIA COW TESTING

DURING the past year the Dairy Branch of the British Columbia Department of Agriculture has put in practice two new ideas to lend interest and value to their cow testing work. One of the new plans, that of issuing certificates of production for grade cows, was instituted in the Wisconsin Cow Testing Associations some three or four years ago, but this is the first time that such records have been recognized in Canada. The other innovation is that of tattooing heifer calves so that a record may be kept of them as they become milkers, and also to enable a record to be kept of the dam and sire and to properly value them as breeding stock.

In order to tattoo a heifer calf and have her registered, it is necessary that the sire be pure bred and that the dam should have a certificate of production or have finished a lactation period which qualifies for a certificate. Heifer calves only are to be tattooed, and only those born since January 1, 1923.

Certificates of production were issued for the year 1922, and for 1921 if the records were on file at the Dairy Branch, Victoria. To qualify for a certificate of production, the cow must be tested regularly from the time she freshens until she goes dry; she must freshen within fifteen months of her previous calving date; and she must produce not less than 6,000 pounds milk and 300 pounds fat.

In 1922, there were 343 certificates issued for records completed previous to January 1, 1923. They were distributed in four of the associations.

These two ideas should give a decided added interest to cow test association work in British Columbia. Dairymen with good grade cattle will be able to secure recognition, and more or less semi-official records will be possible for pure bred cattle not tested under Record of Performance.

The tattooing of heifer claves will enable the owners and officials in charge of cow test associations to keep a record of the calves as they grow up, and also to keep records of the sires of these calves. In this way, it will be possible to save the good sires, and to dispose of the poor sires as the records of their heifers become known.

PART III

Agricultural Education and Related Activities

AGRICULTURAL EDUCATION IN MANITOBA

By R. W. MURCHIE, M.A., Professor of Rural Sociology, Manitoba Agricultural College

THE story of Agricultural Education in Manitoba may be treated under three headings: (1) The Manitoba Agricultural College; (2) Extension work of the College and of the Department of Agriculture; (3) Junior work in elementary and high schools.

(1) Agricultural College

The first attempts at agricultural education in the Province were made in connection with the Dairy School in the winter of 1896 and succeeding winters. The aim of this school was to train specialists who would take charge of creameries and cheese factories throughout the province.

A more comprehensive course in Agriculture was recommended by a commission appointed by the Provincial Legislature in 1902, and to carry out this recommendation the Manitoba Agricultural College was built near Winnipeg and formally opened in 1906. In the following year it was affiliated with the University of Manitoba and provision was made for the granting of a degree in Agriculture (B.S.A.) to students completing the five-year course. In 1912 the College severed its connections with the University and was given degree-conferring powers, but re-affiliation was brought about in 1916. The rapid increase in attendance compelled the authorities to provide a new home and, in 1913, commodious and well-equipped buildings were erected four miles south of the city of Winnipeg, at a cost of approximately four million dollars. This capital cost as well as the cost of maintenance is borne entirely by the Province. Each year the Provincial Government makes an appropriation of over $300,000 for maintenance charges exclusive of interest.

The governing body of the College is a Board of Directors, of whom five are appointed by the Lieutenant Governor-in-Council, and four by associations representing the agricultural interests of the Province.

The curriculum is comprehensive. The five-year course leading to the degree gives opportunity for specialization. A three-year course leading to a diploma in Agriculture is also included. This course is specially designed to give boys a training both in the science and art of agriculture and to fit them for rural citizenship.

Courses in Domestic Science and Domestic Art were instituted in 1910 and later developed into a five-year course leading to a degree in Home Economics. The first class graduated in 1917.

The College also conducts extensive experimental, investigational and research work, and provides many short courses of a technical nature.

(2) Extension Work

The Extension Service was first organized in connection with the College in 1906. In 1917 it was put under the direct control of the Department of Agriculture, but in 1923 was re-established as a branch of the Agricultural College.

This Extension work includes superintending of Agricultural Societies and short courses throughout the country, oversight of Women's Institutes, and general educational work with adults, such as institute meetings. The agricultural representative service was also under this branch, but this has been discontinued, temporarily at least, owing to economic conditions.

Two of the notable features of the extension work are the short courses both in Agriculture and Domestic Science, which have proved very popular throughout the country, and the demonstration trains. The first trains ran in 1911 and succeeding years to 1914. These were "better farming" trains, giving instruction and demonstrations in many lines of agriculture. More recently, specialized trains have been run such as the Live Stock Special Train in which such organizations as the railway companies, the Live Stock Exchange, the Winnipeg Packers, the Pure Breed Association, and both Federal and Provincial Governments co-operated. The object of this type of train is not only to give instruction and demonstrations for better live stock raising but to provide opportunities for the purchasing of pure bred animals.

Much of this extension work is financed through the grant made by the Dominion Government.

(3) Junior Work

Just prior to the war, some attempts were made to introduce special agricultural instruction into the rural high schools and the consolidated schools. Agricultural specialists were attached to the staff of schools such as Roblin, Dauphin, Holland, Stonewall, and Teulon. The outbreak of the war, however, and subsequent economic conditions forced the abandonment of this scheme, and the only school now giving a full course in agriculture is the Teulon Consolidated School. In this school the course runs over three years with one-half day per week each year. In Grade IX, Entomology and Horticulture are featured, in Grade X, Farm Botany and Field Crops, and in Grade XI, Live Stock including Poultry.

In other schools Nature Study is being given considerable prominence. The elementary schools of Manitoba are also attempting to teach some Agriculture in Grades VII and VIII, but no special supervision is given this work except the general oversight of the school inspector; and only a small percentage of the teachers can teach this efficiently.

In Brandon Normal School, Principal Hales has for many years included in his curriculum courses in Agriculture and Nature Study and has developed the school garden idea amongst the students, but none of the other Normal schools in the Province has any equipment for this type of training. A summer school is conducted at the Agricultural College under the direction of the Department of Education, and courses in Agriculture and Home Economics are included in this school.

The most important educational work amongst the young is that accomplished by the Boys' and Girls' Clubs. This movement began in 1913 and grew very rapidly until, in 1919 and 1920, the membership was about 30,000. In the earlier years manual training, poultry, calf and pig raising were very popular, and the projects now included in this movement cover practically every phase of Agriculture and Home Economics. In the last few years, however, a new development has taken place and, in addition to exhibiting at the school fair, the Boys' and Girls' club members prepare themselves to give demonstrations. The following subjects are amongst the most popular: canning, dyeing, millinery, baking, milk bever-

ages, hot lunches, and labour saving devices.

Interest in this work is kept up by interdistrict competitions, and the teams making the best showing in each district are given a free trip to Winnipeg where they compete for Provincial honours.

Live Stock Judging is very popular with the boys, and the teams compete at the Provincial Exhibition, Brandon.

Another recent development from the Boys' and Girls' Club is the Pig Club, which consists of the school children who are preparing for market a number of bacon hogs. These hogs are shipped simultaneously from all points to Winnipeg Stock Yards and judged there by car load lots.

The Boys' and Girls' Club when organized was operated under the Extension Service at the Agricultural College and later by the Extension Service under the Department of Agriculture in co-operation with the Department of Education. In the recent re-organization, Boys' and Girls' Club work is placed entirely under the Department of Education

In addition to the $300,000 mentioned above, which is appropriated for the Manitoba Agricultural College, the Provincial Government spends another $140,000 in agricultural educational work, exclusive of administration. The annual grant under the Agricultural Instruction Act is $78,000, making a total in round numbers of over half a million dollars

AGRICULTURE IN THE SCHOOLS OF ALBERTA

By F. S CARR, Inspector of Schools

FOR many years, in fact ever since Alberta was granted provincial status, the subject of Agriculture has had a prominent place on the curriculum of the Public School. In a province like Alberta, where the rural interest and industry bulk so large in comparison with the urban interest and industry, the necessity for including rural science as a subject for school study requires no argument.

During the early years of the growth of the school system, instruction in agriculture was limited to the last year of the public school course; instruction was formal in the extreme. In a few cases exceptional teachers, each on his own initiative, developed his course to include excursion work and school gardening, a development that justified itself in each case. In fact to the success of these teachers may be ascribed the extension of the work to the last two years of school life and the use of the school garden and experimental plot as outdoor laboratories.

Along with this development of the course in Agriculture in the Public School to include so much practical work, there arose the need for teachers who could interpret this course properly for the pupils. To supply this demand two highly important steps were made by the Department of Education. To equip properly those teachers already at work, the Summer School for Teachers was instituted, an organization at present of such size and complexity that very often the reason for its existence is forgotten; to equip those who intend to make teaching the life work and those who graduated from the High School with a knowledge of the sciences underlying Agriculture, this subject was made a part of the high school course. However, it was soon realized that the use of the high school for university matriculation purposes and that the use of the high school training for purely cultural purposes modified this action; as a result Agriculture like the other sciences became one of the optional subjects.

73638—3½

In the meantime changes have taken place in the viewpoint of the relationship existing between the school and the home. It is recognized that the life of the province depends on agriculture in one phase or another. It is self-evident that every boy and girl should have the opportunity to catch a glimpse of some of the factors controlling this great industry. The school is the place where this may be done best, and it is here that the knowledge of the child may be correlated with this activity that touches every home in the province.

The greatest difficulty lies in the inability of so many to distinguish between practical and vocational, between the art of the subject and its science; in short, to distinguish between agriculture and farming. It must be realised that this subject teaches the application of the sciences, that it develops an interest in home activities, that it teaches the child to see interesting things about work away from the cities, and that it provides a stimulus to the pupil to work out his own individuality. At present the public school is endeavouring to carry out these ideals. The student starts with a foundation of home experiences, each one has his interest held by the fact that the work is practical and definite, and at the same time the child is allowed to work out his own ideas through the various home projects.

There are two courses outlined for the public school. In those schools where such subjects as the manual arts are taught, a general course in Agriculture has been provided. In this course a great deal of the elementary science learned in the previous six grades is viewed in a new light—in its direct relationship to the agricultural activities of the locality. Plants are studied as weeds or plants of use; animals are studied as harmful or beneficial; the soil is studied from its value as a home for plants instead of in its place as part of the assembly making up the world. On the other hand, for schools such as consolidated schools an agricultural course has been designed—a course that can offer more advanced work suitable for those who have already acquired much of the art of farming in the daily experiences of living. The general course has been followed in outline, but so enriched that the student completing it has sufficient knowledge to understand many of the reasons underlying this farm practice, and sufficient training to work out many others for himself.

In short the course in Agriculture in the public schools uses as a foundation the knowledge already in the possession of the pupil. For example, in the booklet work, his training in art and manual arts enables him to go about his project in a workmanlike way; the content is also made up of his personal experiences in his home life. All the work thus centres about activities with which the child is most intimately associated, whether this is canning vegetables, hatching eggs or raising a pig. This knowledge then is used as a starting point for the experimental work, the teaching and the student's reading.

In the High School, at present there is but one year of Agriculture. This is during the third year. There is being considered a re-arrangement of the whole course, and until these changes are made known, it would be most unwise to enter into a discussion. At present the content is such that the student may build on the training in the sciences received in the previous years, and apply this training to the special case of Agriculture. In addition, considerable stress has been laid on the actual doing of a few things essential to the comprehension of the subject, such as gardening projects, milk-testing, soil examinations, etc.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

CANADIAN LIVE STOCK INDUSTRY

The Handling for Meat Production of Sheep and Swine through the Stock Yards and Abattoir System. Article II

By E. B ROBERTS, Editor of The Industrial and Development Council of Canadian Meat Packers

OWING to their carcases being convenient units for smaller dealers, the Canadian trade in swine, sheep and lambs differs from that in beef animals. A larger percentage of the live animals is taken by small packers and by wholesale butchers. More hogs and sheep than cattle are slaughtered on farms either for family use or for sale at country markets. Hence the turnover of the public stockyards is not quite so accurate a measure of the total trade in pork, mutton and lamb as it is in the case of beef.

Only live stock bought by packing firms under government supervision and inspection enters into the export trade. Such product alone can carry the government guarantee of wholesomeness implied in the stamp, "Canada Approved". Yet only a part even of these purchases is prepared for the overseas market; the bulk goes into the domestic trade.

The Bacon Hog

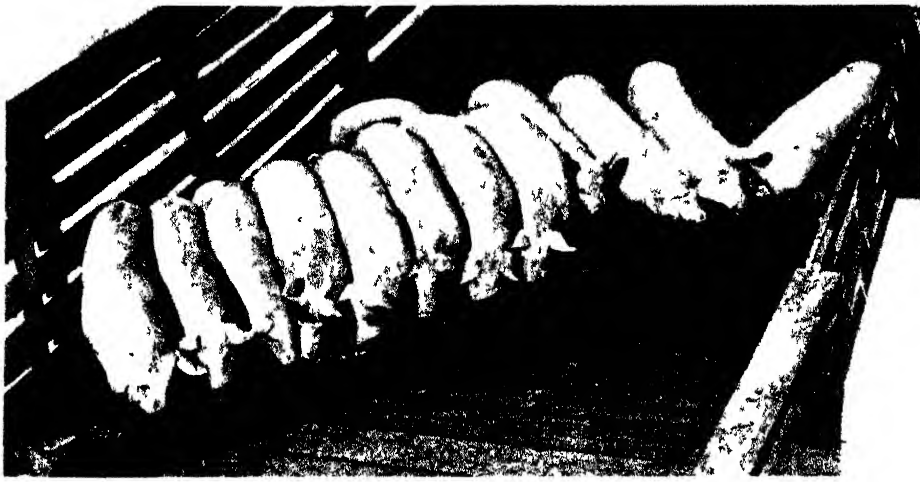
Bacon forms the chief article of Canadian meat exports. The statistical tables demonstrate this fact. Its successive steps from farm to shipside in Canada, and its subsequent progress when imported into Great Britain are worth outlining.

But first a brief digression on definitions. Throughout Canada the old term "hogs" (of Celtic origin, traceable in Welsh and Erse to-day) is used in the general sense for all swine comprehended in the term "pigs" (a word of Dutch origin) in Great Britain. When "pigs" are mentioned in Canada, the word is usually employed as "piglets" is in England; when "hogs" is the word used it is in no way restricted, as the sense sometimes is in England, to castrated males, for which the common Canadian equivalent is barrows. "Pigs," of course, "is pigs" but in Canada they're hogs.

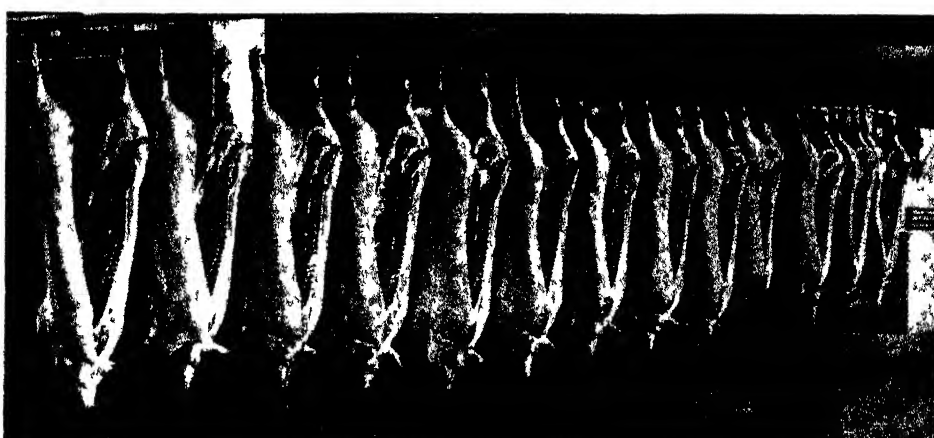
Marketing and Grading.—Hogs are usually sold by the farmer-producer to a drover, who gathers the lots at the country railway station where he makes up a car lot or railway waggon load, a number that may run from 65 to 90.

For over a year a system of grading hogs has been in force under the direction of the Dominion Department of Agriculture. Nine main grades have been defined, and all hogs on stockyards are classed into one or other of these, and payment is usually made on the graded basis; elsewhere it is not so general.

The ideal in this setting of hog standards is the "Select" bacon hog. This is defined as one that "weighs 160 to 210 pounds at the stockyard



A Litter of Thirteen all graded as Select Canadian Bacon Hogs



Carcases on the packing house rail of the thirteen Select Bacon Hogs shown alive in the accompanying picture

or abattoir, of a type and finish indicating suitability for the production of choice bacon or 'Wiltshires' for export". Price, however, is based on the animal classed as the "Thick Smooth", of the same weight and general quality of flesh as the "Select", but owing to difference in conformation, generally a shortness of body, one that will not yield a carcase with the requisite length for the English market. Since the object of grading is the raising of standards, meat packers, when the system was instituted, voluntarily agreed to pay more for the "Select" bacon class than for those classed as "Thick Smooth". For the other classes there are graduated discounts. Should the drover sell to local butchers not purchasing on stockyards, no grading is necessary, but the product can enter domestic trade channels only. Once the carlot is consigned to the public stockyards or direct to the packinghouse, it must be graded by independent officials, appointed by the Dominion Government. Their classification is entirely a matter of eye judgment. There is, of course, a certain margin of error, but on the whole the system has worked with fair satisfaction since it was inaugurated in November, 1922, and it is now being steadily extended.

Slaughter and Inspection.—At almost every Canadian packinghouse a part of the hog supply is delivered direct by farmer's car or motor truck. The limit range of collection seems to be about 25 miles. Owing, however, to the occasional severity of the Canadian winter, the state of the roads is often a factor of more importance than the actual distance.

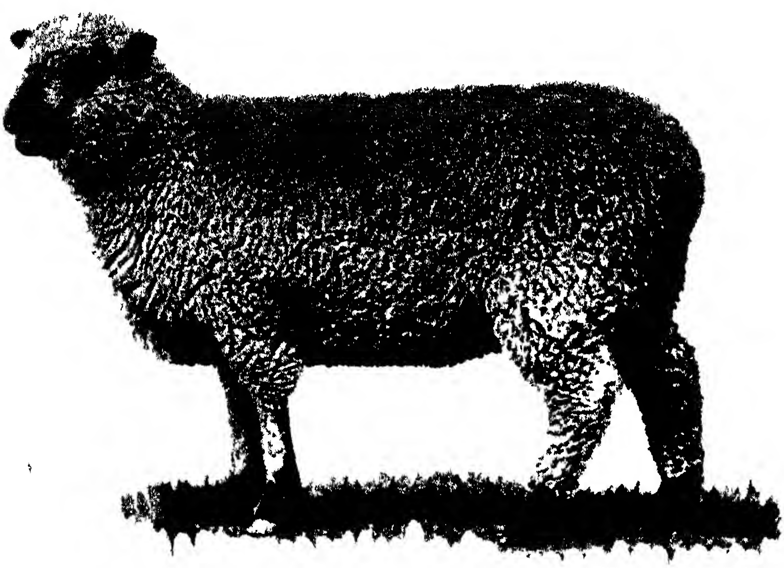
Slaughter is machine-like in its method. As a rule the actual killing place is on the top floor of an abattoir. The advantages of this will be indicated. Some firms keep all hogs of one grade apart from others, but practices differ. Pig after pig comes forward on automatic conveyors and passes before the killer. In a few minutes bleeding is complete and the carcase—one advantage of starting on the upper floor—is slid down the chute into the scalding vat. After the proper immersion, the carcase is picked up on a forward-moving flat bed or feed belt, about five feet wide, and conveyed into the dehairing machine. This is not unlike a large drain pipe laid horizontally. As the scalded carcase goes head foremost through the pipe, the bristles are slapped off by quickly revolving flappers or beaters fitted to the inner surface of the pipe. When it emerges, it is again hitched to a chain and drawn up through another pipe-like tube, arranged vertically, on whose inside surface are strong jets of gas flame which singe off any hair that may have escaped the beaters. This gives a thin, delicate rind to the bacon. There is also a certain chemical action caused by heat on the outer skin which is of considerable importance for the retention of the juices in the bacon at the rind. Following the singeing, the carcase is scraped clean and washed by men handling flexible scrubbing brushes through which jets of water shoot. Here begin the various cutting up processes, removal of the head, viscera and so on.

At this point also begins government veterinary inspection, which, on the whole, does not differ materially from that described for beef animals in an earlier section of this descriptive article. The selfsame care is exercised in keeping apart from the good all carcases or cut-off parts suspected of unfitness. If there is the least doubt, tags with the word "Held" are pinned immediately on both the carcase and the dissevered parts. These must then come under the personal scrutiny of the senior inspection officer. If the damage is only local and unimportant, the por-

tion may be cut out and the remainder passed. If, however, it is not passed, it is tagged "Condemned", and in that case the whole carcase or portion goes into the steaming tank to be made into fertilizer

At every step in a well conducted abattoir the advantage and economy of having the slaughter performed on the top floor is apparent. As each part is removed from the hanging carcase, it is placed upon a travelling table, 30 to 40 feet long, and is scrutinized by the inspector as it passes steadily forward. When approved and passed, each part is dropped through a different chute into its respective place on the storey beneath, and is then dealt with according to trade needs. The carcase, with head removed and split down the back bone into two halves, passes into the cooling room. Indeed, from the moment it came out of the scalder or singeing machine until ready for the brine cellar, it has been hanging on the same hook, carried round by an overhead endless chain, each workman doing successively his allotted job as it moves onward.

Curing.—The sides are sorted into classes according to their suitability for domestic or export trade. Those intended for Canadian home consumption are dissected into somewhat different "cuts" from those customary in England, but the sides suitable for London and Liverpool are trimmed into the "Wiltshire" cuts. These are branded with the firm's trade designation and processed, giving enough pickle to permit the sides being transported to the seaboard and across the Atlantic, eventually to English smokehouses. Contrary to the general belief in the Dominion, bacon for English consumption is not smoked in Canada; that is done entirely after it arrives in Great Britain by agents of the exporting firms or by bacon curers who handle it according to their ideas of what will suit the trade and the customers for their own particular brands.



Perfect type of 80-pound Canadian bred Market Lamb.

Disposal.—Bacon is not to any extent sent to Great Britain " on order." It is sent subject to sale at market price on the day of its arrival, whether that be high or low. Packers, therefore, have to " take a chance " on profit, for they have no sure means of forecasting a bacon market in England a month or six weeks after they purchase the live hogs at the prevailing market prices on Canadian stockyards.

The home market absorbs the bulk of Canada's hog product. Now that domestic demand is being fully met, it is evident that, to be profitable, any further increase in live hogs on farms should be of the "select bacon" type suitable for the export trade

Sheep and Lambs

For sheep and lambs much the same method of slaughter obtains, except that there is no compulsory grading system. Nor is there scalding or dehairing, the pelt being removed by three or four men each " doing his bit " while the hanging carcase passes before him. (The modern meat packing industry would certainly have furnished Adam Smith with as good an example of the division of labour as his classic instance of the pin makers in " The Wealth of Nations.") Inspection for wholesomeness is made, as in all cases, by Dominion veterinary officials who are responsible only to the Dominion Minister of Agriculture.

From the accompanying tables it will be seen that the quantity of Canadian mutton exported to Great Britain since 1914 has been small compared with the exports to the United States. These statistics also make evident the fact that the total export trade is almost offset by an import trade in the same meat product. The seasonal nature of supply is one of the causes for this seeming anomaly, while the wide expanse of the Dominion, lying east and west for 3,000 miles along the northern frontier of the United States, is another factor. In many localities there is a market for farmers just across the international boundary, while it may be 1,500 miles to the nearest Canadian stockyard. The same facts influence trade " on the hoof " in sheep and lambs. For instance, there is in the Atlantic Provinces an important trade in lambs sent by rail or water to the Boston and New York markets. Somewhat similar conditions rule in British Columbia and in sections, at least, of the Prairie Provinces. This interchange is likely to continue despite the interplay of tariffs.

Excepting on the western ranches, the number of sheep kept on Canadian farms is rarely large; in fact, there are few that equal the number on an average farm in Scotland or Wales. The per capita consumption of mutton and lamb in the Dominion is about one-third that in Great Britain, though in fresh pork, due largely to climatic conditions, consumption is far larger.

In the immediate post-war years of 1920 and 1921, large quantities of frozen lamb and mutton were imported from New Zealand. This was part of the accumulated war stock. Sales, however, were disappointing to the consignors. The ingoing of the items is shown in the table of imports for 1920 given herewith, and their outgoing in the table for exports for the years 1921-22.

The following tables gives the yearly number of swine and sheep in the Dominion since 1914:

NUMBERS OF SHEEP AND SWINE IN CANADA, 1914-1923

Year	Sheep	Swine
1914	2,258,445	3 434,261
1915	2,038,662	3,111,900
1916	2,022,941	3,474,840
1917	2,369,358	3,619,382
1918	3,052,748	4,289,682
1919	3,421,958	4,040,070
1920	3,720,783	3,516,678
1921	3,676,000	3,905,000
1922	3,262,500	3,915,500
1923	2,753,860	4,405,316

The following table gives the numbers of sheep and swine slaughtered in inspected packing plants in Canada since 1914:

NUMBERS OF SHEEP AND SWINE SLAUGHTERED IN INSPECTED PLANTS, 1914-1923

Fiscal year	Sheep and lambs	Swine
1914	499,280	1,799 060
1915	447,173	2,598,338
1916	403,147	2,363,693
1917	416,575	2,245,511
1918	336,897	2,126,862
1919	397,961	2,334,354
1920	601,170	2,171,650
1921	682,680	1,686,059
1922	654,705	1,727,296
1923*	499,745	2,256,474

NOTE—*Calendar year.

EXPORTS OF PIG MEATS, 1913-1923

Fiscal year	Bacon Exports	
	Lbs.	Values
		$
1913	36,212 190	5,350,845
1914	23,859,754	3,763,196
1915	76,801,419	11,811,825
1916	144,918,867	25,710,767
1917	207,213,267	43,011,439
1918	199,957,475	57,995,116
1919	120,622,092	39,046,058
1920*	223,642,600	70,123,580
1921	98,233,800	31,492,407
1922	99,208,000	23,012,480
1923	101,590,100	22,536,397

EXPORTS OF PIG MEATS, 1913-1923—*Concluded*

	Ham Exports	
	Lbs.	Values
		$
1913	2,426,654	322,669
1914	1,890,182	269,911
1915	17,958 874	2 652,917
1916	8,732,857	1,379,346
1917	4,403.244	766,595
1918	7,875,523	2,087,378
1919	4,066,649	1,196,117

NOTE.—*Hams included with bacons from 1920 onward.

	Pork (All)	
	Lbs.	Values
		$
1913	521,533	57,960
1914	1,811,204	202,391
1915	21,288,226	2 599,844
1916	13,142,169	1,990,856
1917	13,987,460	2,522 926
1918	7,909,803	2,052,192
1919	37,318,106	11,711,024
1920	6,680,300	1,641,570
1921	3,125,700	802,472
1922	2,924,800	453,708
1923	2,670,500	451,682

MUTTON EXPORTS—QUANTITIES, 1914-1923

Fiscal year	To United Kingdom	To United States	All Countries
	Lbs.	Lbs.	Lbs.
1914	....	53,571	65,167
1915	....	1,029,021	1,064,963
1916	....	45,973	99,593
1917	89,240	44,543	167,993
1918	184,513	589,625	855,517
1919	....	....	....
1920	320,800	4.658,600	6,140.100
1921	....	6.242,100	6,405,500
1922	773,000	6,998,800	7,877,000
1923	....	3,502,200	3,610,000

MUTTON EXPORTS—VALUES

Fiscal Year	To United Kingdom	To United States	All Countries
	$	$	$
1914	....	9,471	10,804
1915	....	119,911	124,087
1916	....	7,800	14,360
1917	13,452	9,185	27,491
1918	47,225	128,273	192,224
1919	....	....	....
1920	51,887	1,027,172	1,314,573
1921	....	1,595,111	1,595,111
1922	122,177	1,198,783	1,342,146
1923	....	827,426	847,233

IMPORTS OF MUTTON AND LAMB INTO CANADA—QUANTITIES

Fiscal year	United Kingdom	United States	All Countries
	Lbs	Lbs	Lbs
1914	251 287	3 821,777	5 610 812
1915		2 955 582	3 451 812
1916		2 715 338	2 841 838
1917		2,458 104	2 458 104
1918		1,742,606	2,298,630
1919			
1920		2,365 105	4 842 904
1921		2 910 737	7 847 701
1922		2 630 357	3 416 332
1923		1 147,018	1 460 130

IMPORTS OF MUTTON AND LAMB INTO CANADA—VALUES

Fiscal year	United Kingdom	United States	All Countries
	$	$	$
1914	25 151	425 941	566 794
1915		335 933	370 330
1916		325 217	334 856
1917		360 972	360 972
1918		355 296	418 040
1919			
1920		490 182	803 774
1921		562,806	1,272 165
1922		420 794	533 005
1923		226,384	261 382

The following table gives the quantity of Canadian bacon and pork imported into Great Britain yearly since 1908 as reported by the British Board of Trade:

IMPORTS INTO GREAT BRITAIN OF CANADIAN BACON AND PORK, 1908–1923

Year	Bacon	Pork
	Lbs	Lbs
1908	68 776 000	249 000
1909	44 339 000	310 000
1910	41 194 000	198 000
1911	61 581 000	97 000
1912	38 740 000	43 000
1913	24 352 000	4 000
1914	34 228 000	55 000
1915	86 419 000	5 849 000
1916	159 411 000	10 198 000
1917	176 708 000	12 279 000
1918	171 974 000	5 539 000
1919	209 425 000	33 106 000
1920	167 217 000	1 540 000
1921	94 531 000	409 000
1922	82 575 000	395 700
1923	99 230 100	2 072 000

NOTE—The British import classification differs somewhat from the Canadian export classification

PRODUCTION OF SLAUGHTERING AND MEAT PACKING ESTABLISHMENTS CANADA 1920 1921 AND 1922

Kind		1920	1921	1922
Meats sold fresh—				
Beef	lb	297 297 955	264 356 063	292 945 201
	$	55 239 777	35 636 366	28 240 355
Mutton	lb	46 941 632	34 043 637	32 512 028
	$	10 297 988	6 693 557	5 973 139
Pork	lb	75 686 123	77 668 607	89 948 380
	$	21 669 071	16 601 197	16 691 166
Veal	lb	22 571 511	19 535 961	27 490 961
	$	4 592 955	2 950 410	3 375 827
Other	lb	10 563 374	5 069 370	8 000 208
	$	2 095 773	790 823	925 245
Meats cured—				
Beef salted or cured	lb	8 977 202	563 564	2 956 599
	$	1 679 524	73 310	214 985
Pork salted	lb	45 170 076	40 843 257	34 573 523
	$	13 276 170	9 147 740	7 334 710
Hams	lb	41 392 002	19 707 184	24 751 907
	$	15 801 386	6 316 990	6 452 580
Shoulders	lb	32 799 091	55 735 498	19 385 422
	$	10 131 900	13 685 897	3 714 678
Bacon and sides	lb	96 128 042	55 433 782	66 366 742
	$	36 772 497	17 381 025	17 424 984
Other cured meats	lb	10 015 800	10 650 154	43 875 012
	$	3 244 753	2 756 795	9 366 306
Sausage fresh and cured	lb	28 547 527	23 045 178	24 456,021
		6 353 748	4 274 777	3 815 190
Sausage casings	$	*	*	746 552
Canned meats	lb	6 396 305	7 457 028	5 386 571
	$	1 591 447	1 451 856	1 028 905
Cooked meats	lb	11 800 363	14 237 793	13 657 643
	$	5 189 585	6 006 393	5 065 946
Lard	lb	54 451 356	72 151 773	49 338 784
	$	14 950 621	11 751 806	7 670 130
Lard compound	lb	**	**	15 733 230
	$			2 145 929
Shortening, other	lb	**	**	17 743 822
				2 518 317
Tallow	lb	14 051 223	13 996 919	13 436 257
	$	2 031 904	868 243	1 004 172

*Included with all other products

**Lard compound and other shortening included with lard

PRODUCTION OF SLAUGHTERING AND MEAT PACKING ESTABLISHMENTS, CANADA 1920, 1921 AND 1922 (concluded)

Kind		1920	1921	1922
Oleo	lb	2 631,050	5,538 080	2,407,950
	$	1,720,777	1 075,292	238,909
Other oils	lb	*	*	7,011,971
	$			714 399
Oleomargarine	lb	10 565 055	3,024 625	2,326 986
	$	3 673 072	755 053	435 784
Stearine	lb	9 371 518	645 891	91 765
	$	2 347 516	75 669	10 557
Animal tankage	tons	12 171	14 068	13 630
		607 358	366 838	480 807
Bones raw ground etc	ton	5 699	2 784	8 843
	$	480 864	104 377	314 131
Complete fertilizers	ton	7 370	6 522	2 595
	$	573 656	238 768	145 107
Glue	lb	29 379		[illegible] 549
	$	8 042		145
Glue stock	lb		379 278	.
	$		7,645	
Hides	No			552 744
	$	10 561 070	2 827 309	4 190 944
Skins sheep	No	607 937	647 435	496 316
	$	1 270 488	405 258	517 914
Skins calf	No	[illegible] 685	155 114	254 180
	$	445 445	230 253	391 193
Wool	lb	450	161 585	17 550
	$	67	59 203	460
Hair	lb	2 357 802	1 689 391	1 010 200
	$	174 440	94 755	4 138
All other products	$	13 748 [illegible]	10 445 [illegible]	11 [illegible] 540
Amount received for custom or contract work	$	11 593	63 185	178 943
Total Value of Production	$	241 544 618	155 136 289	143 414 693

*Other oils included with oleo

CLEANING GRAIN AT THE THRESHER

Results of Experiments with a Portable Disc Recleaner Conducted by the United States Department of Agriculture in 1923, from the Report of the Specialists in Charge of Grain Cleaning Investigations.

A SURVEY based on the reports of 1,400 elevators in Minnesota, North Dakota, South Dakota and Montana shows that the percentage of dockage in the 1923 crop of spring wheat marketed by farmers up to November 1, in these four states is 7·6. This means that 11,650,800 bushels or the equivalent of 13,980 carloads of dockage were hauled in the wheat to the country elevators in the Central Northwest. A large part of this dockage should have been cleaned out and used for feed on the farm. In one state, the average wheat farmer harvested, threshed and marketed a half peck of weed seeds with every bushel of wheat.

If this dockage had been removed before marketing, a saving equivalent to a materially increased price per bushel for the wheat would have been received for the clean wheat. The spring wheat farmers, in South Dakota, Minnesota, and North Dakota who cleaned their wheat before marketing gained at least 7·3 cents per bushel as a result of the cleaning.

A Suitable Cleaner

Experiments have been carried on for several years to build a cleaner suitable for use at the thresher, in the Central Northwest. To clean grain satisfactorily as part of the threshing

operation requires a cleaner of large capacity, which will remove the dockage and other foreign material without appreciable loss of grain, and do this as fast as the grain is threshed.

Five types of cleaners were used in the 1923 experiments to develop cleaners for use at threshing machines as fast as the grain is threshed. These five types were: a large portable disc recleaner, deck disc recleaners, a sieve or large fanning mill type, a Bates aspirator and a deck cylinder type.

The portable disc type cleaner designed for the 1923 experiments, and the only one described in this report, was found to be well suited for cleaning wheat and rye as part of the threshing operations in the principal spring wheat states. The portable type of disc cleaner was evolved from the experiments during the two previous years with the deck type of disc cleaners.

In the 1921 and 1922 experiments, disc cleaners were attached to the decks of the threshing machines. The 1923 experiments were conducted with a disc cleaner having slightly different construction of discs and housing. A double-leg elevator was added, and the cleaner and elevator were driven with a gasoline engine. The cleaner, elevator and gas engine were all mounted on a four-wheeled truck, making a complete and independent grain cleaning outfit, which was moved from one threshing machine to another as desired.

In addition to cleaning grain at the thresher, the portable cleaner can be moved on its truck from farm to farm and used at any time of the year for cleaning seed grain or for cleaning market grain on farms which did not have recleaners operating with the threshing machines.

Disc Principle of Separation

Of the weed seeds found in threshed wheat and rye, those seeds which are either smaller or larger in diameter than the wheat or rye kernels can be removed readily by the use of screens or sieves. But such foreign seeds as wild oats, barley, wild peas and corn cockle, which have about the same diameter as the wheat kernels, pass through the screen or sieve openings along with the wheat or rye. However, wild oats and barley are longer than wheat or rye, while cockle and wild peas are shorter than wheat or rye, and these seeds can therefore be efficiently removed by the disc cleaner.

In cleaning grain with the disc recleaner, mechanical methods are used to make separations of materials according to their length. The disc cleaners will therefore separate from wheat and rye not only the weed seeds which are smaller than wheat and readily separable by sieves but also such other foreign seeds as wild oats and cockle which are longer than wheat, and will do this without appreciable loss of wheat in the screenings.

Description

The portable disc recleaner used in the 1923 grain-cleaning experiments contained thirty-one discs, each approximately twenty-five inches in diameter.

The recleaner had a capacity of 175 to 200 bushels per hour of threshed Hard Red Spring wheat, and a capacity of 135 to 160 bushels per hour of threshed rye and large Durum wheat.

Of the thirty-one discs used, the first fifteen had small pockets for removing the small weed seeds, and the other sixteen discs had larger pockets for removing the wheat and rye from the wild oats and other coarse material.

The second sixteen discs have similar pockets of larger dimensions which remove the wheat and the rye kernels from the wild oats, barley and other coarse material.

The third, fourth and fifth wheat disc remove the cleanest and heaviest wheat and, if desired, this wheat can be taken off and saved for seed wheat through a sacking spout on the front side of the cleaner.

The wild oats and other coarse material which are longer than wheat are not removed by any of the discs. This coarse material flows through an opening in the end of the casing into a spout at the tail end of the cleaner, which leads it into the left leg of the double elevator and is elevated into a second wagon or into sacks.

Results

The portable disc recleaner was operated during 1923 in connection with various threshing machines located in South Dakota, Minnesota and North Dakota. The recleaner was moved to various districts in these three states so that all kinds of conditions, types of threshing machines, and varieties and amounts of weed seeds would be encountered.

Records were kept of all the wheat and rye that was threshed and cleaned at the various locations. Seventeen lots of grain comprising 6,205 bushels of Hard Red Spring, 1,150 bushels of Amber Durum, 600 bushels of Red Durum, and 5,000 bushels of mixed wheat, and 2,800 bushels of rye were cleaned with the portable disc recleaner as part of the threshing operation.

Effect on Dockage.—Fourteen lots of wheat containing from 3 per cent to 15 per cent of dockage were cleaned. One of the lots containing 15 per cent dockage was Durum wheat and was threshed at the rate of slightly over 200 bushels per hour. This was the only lot of grain that was not entirely cleaned to a dockage-free basis. This lot after cleaning contained only one per cent of dockage, which was principally foxtail. A slight change which was later made in the recleaner would undoubtedly have removed the remaining assessable dockage. The other lots of wheat were each cleaned to a dockage-free basis. The three lots of rye containing from 7 per cent to 24 per cent dockage were all cleaned to a dockage-free basis.

Effect on Foreign Matter Other than Dockage.—The portable disc recleaner, in addition to removing the dockage, cleaned out principally all of the cockle, wild rose and wild peas which function as " foreign matter other than dockage " in the inspection and grading of grain. Such weed seeds are generally referred to as inseparables, and when present in sufficient amounts, lower the grade of the wheat in which they appear. In nine of the fourteen lots of wheat cleaned, the grade of the wheat was raised because most of the " foreign material other than dockage " was removed in the cleaning operation. In one lot the grade was raised two grades or from grade number 4 to grade number 2 on this factor alone.

Effect on Test Weight.—The " test weight " is the principal grading factor in determining the numerical grade of wheat. The wheat after passing through the portable disc recleaner was higher in test weight in every instance than the same wheat before it was put into the recleaner, although the test weights in each case were determined on the wheat after removal of dockage by the dockage tester in accordance with the Federal grading rules. An average increase in test weight of 1·0 pound was secured on the wheat, and an average increase in test weight of 0·7 pound was gained on the rye as a result of cleaning. This increase in test weight was sufficient to raise the grade on eight of the fourteen lots of wheat and to raise the grade on one of the lots of rye.

Effect on Storage and Hauling.—The average test weight of the uncleaned threshed wheat in which the test was made before removing the dockage was 52·4 pounds. The average test weight of the cleaned grain was 55·4 pounds, or a higher test by exactly 3 pounds in favour of the cleaned wheat. This fact has important bearing on the storing and hauling of wheat because the 2150·42 cubic inches of space occupied by a measured bushel of wheat should be filled with wheat and not by wheat and dockage.

A lot of wheat containing 15 per cent dockage has a test weight of but 52·4 pounds, and therefore the bushel measure will hold only 44·5 pounds of wheat, the remaining space in the bushel measure being occupied by the dockage. The space occupied by the wheat in this case is slightly less than three-fourths of a bushel by measure. The farmer who has 15 per cent dockage in his wheat is therefore able to haul only three-fourths of a normal load of wheat because one-fourth of the wagon box space is occupied by dockage, whereas if he were marketing clean wheat, his wheat-hauling capacity per load or per day would be increased one-third.

Amount of Grain in Screenings

The amount of grain lost in the screenings removed is one of the real indicators of the efficiency of any cleaner. The elevator operator who buys uncleaned wheat and then cleans it ordinarily loses in the screenings about one per cent of the net wheat. The efficiency of the portable disc recleaner is such that only $\frac{4}{10}$'s of one per cent of the wheat was lost in the screenings.

Gains by Using Recleaner

Samples of all the lots of grain were secured from the stream of uncleaned grain coming from the thresher to the cleaner, and from the stream of cleaned grain leaving the cleaner. After the threshing season, the thirty-four samples of the cleaned and uncleaned wheat and cleaned and uncleaned rye were submitted to several mill and elevator buyers for bids, and the bids on each sample averaged.

Gain in Price Per Bushel.—An average increase in price of $2\frac{1}{2}$ cents per bushel was offered for the cleaned over the uncleaned samples in the case of the Hard Red Spring wheat, an average premium of 3 cents per bushel was bid for the cleaned Amber Durum; no premium was bid for the cleaned Red Durum because the grade remained the same and also one per cent dockage remained in the cleaned sample; an average premium of $4\frac{1}{2}$ cents was bid for the cleaned mixed wheat, one lot of which had been raised two grades by cleaning; and for the cleaned rye a premium of $\frac{1}{2}$ cent per bushel was bid on one lot, no premium being bid for the other two lots.

Saving in Freight—While the average dockage on the grain before cleaning was slightly below the average for the sections where this wheat was grown, the saving in freight alone by shipping the cleaned wheat amounted to 1·2 cents per bushel. All the wheat shipped had a freight rate of 12 cents per bushel or less. Many farmers in the spring wheat states have freight rates higher than 12 cents per bushel and would therefore gain even more per bushel by cleaning their grain before shipment.

Farm Value of Screenings—The screenings were assigned a farm value of **$10** per ton, although mill oats were worth **$17** a ton and fine seed screenings were worth **$14** a ton in Minneapolis at the time.

Net Gain Secured By Farmers—The saving as a result of the cleaning with the portable disc recleaner was at least 7·3 cents per bushel, and allowing 2 cents a bushel for the cost of cleaning, the net gain received by the farmers was 5 3 cents per bushel.

Foot Note 1.—Of the other types of cleaners used in the experiments the "deck cylinder type" may be found to be efficient and practical after several structural changes are made in its design. The Bates aspirator and the fanning mill type of thresher recleaners are entirely practical in the Pacific Northwest but are not recommended for use in the spring wheat area.

TREE PLANTING AS AN AID TO AGRICULTURAL DEVELOPMENT ON THE PRAIRIES

By C A EDWARDS, Dominion Forestry Branch

SEVENTY million seedlings and cuttings is a large planting order, but it represents actually the extent to which the demands from prairie farmers for trees have been met by the Dominion Government Forestry Branch in the past twenty years. It proves the fact that trees are just as indispensable to the congenial life of farming communities as they are to dwellers in our western towns and cities, where trees planted along the streets and boulevards and in well designed parks, spread shade and shadow over green lawns and flower beds in front of many fine public buildings and residences.

Although many prairie farms are still bare of trees, it does not follow that they must for ever remain so. On the contrary, there is probably nothing that will give more satisfaction at a smaller cost in time and money than well established belts of trees protecting the fields, gardens and farm buildings.

Much has been written concerning prairie tree planting, and many valuable suggestions have been given by men whose efforts in making their prairie surroundings more congenial have met met success, so that a strong demand persists for trees to improve and beautify this western country, both in civic and rural communities.

Nor have efforts so far been in vain. Through a close supervision of prairie plantings, sufficient information is available to give a fairly accurate idea of the progress being made, and the many benefits derived by those farmers who are giving a little time to the improvement of their holdings by the addition of well disposed tree belts and field shelters. When we speak of growing, distributing, and planting millions of trees, we are interested chiefly in the results obtained and the value of such plantings to the country generally. First, we must remember there are certain factors under our prairie conditions on which the successful and healthy growth of trees depend. It is not enough, under such varying conditions of climate in the West, with one territory more favoured than another, to simply plant the young seedlings and leave them to live or die as the natural elements see fit. Certain cultural methods are known to be absolutely essential if success would be achieved; and where such methods are followed there is no difficulty in establishing tree growth anywhere in the prairie provinces. Several thousand planting reports each year furnish a fairly accurate census of the results of farm shelter belt planting, and may be considered typical of the tree planting situation as a whole. These reports indicate that 75 per cent of the trees in belts now established, are, from the point of their

Typical prairie country and small settlement in contrast with a well treed farm home. The trees show six seasons growth

Seven year old trees planted for field protection at Altario, Alberta. Fruit trees and small fruits are now being grown between the protecting belts

cultivation, ground cover, and general appearance, in good healthy condition; serving the dual purposes of shelter and protection, besides the added comfort of pleasant surroundings. The other 25 per cent are divided between a fair and neglected condition. This does not imply that these trees are all a failure, because many would doubtless respond readily to the human touch in the matter of cultivation and attention. New plantings, that is, the distributed planting material of nearly five million seedlings and cuttings set out in the present year, average between 85 and 95 per cent living. In the past twenty years much information and better knowledge concerning the suitability and growth of trees on the prairie has become available, so that it is safe to predict a continued strong movement in western planting, which is already having a marked effect on the attractiveness and character of the country generally.

As an aid to agricultural development, trees have more than a money value. They are of national importance allied with agriculture in the West, and a potent factor in attracting, and what is of greater importance, holding settlers, for there are few people to-day who fail in some measure to enjoy and appreciate the comforts that trees bring to their daily life and surroundings. Apart from this aspect, there is a strong feeling that exclusive grain growing must gradually give place to a more diversified system of farming, and tree planting is one of the big factors in permanent farming activities in Western Canada, and will assist in bringing about a more settled and better agriculture.

RUST OF WHEAT

SO long ago as 1907, Professor Biffin discovered that resistance to Stripe Rust (Puccinia glumarum) is a character which, like many others possessed by plants and animals, is handed on from parent to offspring. He showed, moreover, that resistance to this rust fungus reappears in the second generation of a cross between a resistant and a susceptible variety of wheat. Yet in spite of this discovery epidemics of rust still afflict the wheat crops of the world, reducing yields by so much as fifty per cent. Thus in Minnesota during the ten-year period 1911-1920, rust was epidemic in three years, 1916, 1919 and 1920. In the years when rust was not epidemic the average yield of spring wheat was 15·4 bushels per acre; in the rust-epidemic years it was only 8·6 bushels per acre, truly a case, so far as farming profits are concerned, of the lean kine devouring the fat kine. An impatient person, knowing but little of rusts or research, might conclude in view of these facts that all the labours of science in relation to the suppression of rust have been in vain. Such a conclusion is singularly ill founded. In order to show how erroneous it is, a brief account is given of recent progress* on the experimental investigations of rust and rust resistance. The problem of preventing attack by rust is a complex one, for there are several different species of rust fungus parasitic on wheat. There is the Stripe Rust fungus, Puccinia glumarum, which is that investigated by Professor Biffin in the researches already referred to; there is the Crown Rust, Puccinia coron-

*"Wheat Stem Rust from the Standpoint of Plant Breeding." By H. K. Hayes and E. C. Stakman. Minnesota Experiment Station. No. 300. Journal Series.

arum, and the Black Stem Rust, P. graminis, which though responsible for less damage to wheat in this country (Great Britain) than is caused by certain other rusts, works havoc, as has been shown in crops of spring wheat in Minnesota. Each of these parasitic species does evil after its kind, and the power, unfortunately, of resistance to attack by one species does not mean power of resistance to all. Hence the plant breeder who desires to endow the world with rust-resistant varieties of wheat must be content to deal with one rust at a time. Along these lines good progress has been made and it is well known that hybrid varieties of wheat have been produced at Cambridge by Professor Biffin which combined resistance to Puccinia glumarum—Stripe Rust—with other desirable qualities. These resistant varieties retain their resistance generation after generation. But in the case of other rusts, P. graminis, for example, it appears from the researches of Messrs. Hayes and Stakman (*loc. cit*) and other investigations that the problem of resistance is not so simple. The reasons why the solution is proving more difficult are two: the versatility of the rust species and the sterility of potentially resistant hybrids. Puccinia graminis, among the recognized multitude of fungi known to bring about disease in plants, was one of the first to be discovered. So long ago as the seventeenth century, relation was discovered between the presence of the Barberry and the prevalence of the pest, and laws were passed both in France and North America requiring the extirpation of the common Barberry from the neighbourhood of cornland—laws which it is to be feared were more honoured in the breach than in the observance. In any case, Puccinia graminis, which is now known to belong to that class of organism to which a change is essential still flourishes. It spends the spring of each year in the Barberry, goes away for the summer to the Wheat field, does nothing in the winter and resumes its Barberry existence in the following spring. Whether it is due to the stimulating effect of change of habitat or to some other cause is not known, but the fact is certain that Puccinia graminis is a species composed of numerous races and that these different biological races may be distinguished from one another if not by size, or shape, or colour, yet by their power of attacking the Wheat plant. It is as though some were more savage than others—able to enter and maintain themselves in the tissues of a given variety of wheat, whereas a less savage race of the rust might not enter alive. This being the case the problem of breeding varieties of wheat which shall possess powers of resistance to P. graminis becomes at once clearer and more complex. Restated, it means the breeding of wheat varieties resistant to all—including the most "savage"—biological races of Black Stem rust known to occur in the country in which the wheat is to be grown. To do this, however, means that the different biological races have to be discovered and their powers of infecting wheat of the varieties to be used for cross breeding have then to be ascertained. The magnitude of this task on which Messrs. Hayes and Stakman are engaged may be judged from the fact that the number of biologic races of P. graminis is very large—in Minnesota upwards of thirty-six races have been isolated. Fortunately, the races although numerous, appear to be stable. Their appetite does not, as was once believed, grow by what it feeds on; in other words, a race does not apparently work itself up into a state of greater virulence by living on a variety of wheat which falls an easy victim to it. Each race appears to retain a fixed power of infection so

73638—4½

that it may be investigated, ticketed and put away for further experimental use. Once a set of the biological races has been obtained and their relative powers of infecting a variety of wheat ascertained, it is, of course easy to ascertain, e.g., by cultivating a few seedling wheat plants in a greenhouse, the degree of resistance of other varieties (and species) of wheat. This the authors have done in the case of several varieties of common wheat. It is a relief to find from the result of their experiments that varieties exist (of winter wheat) which are absolutely immune to nearly all the biological races of P. graminis; such a variety is Kanrid, used for breeding purposes. This variety was crossed with Marquis—which is a susceptible spring wheat. In the third generation varieties were obtained which combined the "earliness" of Marquis with the resistance of Kanrid. Investigations carried out by inoculating seedlings with spores of the different biological races of P. graminis show that varieties belonging to certain types of wheat, e.g., Triticum durum and T. Dicoccum, also possess great powers of resistance to the rust, but the difficulty of making use of this desirable quality is rendered very great by reason of the high degree of sterility which exists in the hybrids between these types of wheat and those of common wheat. Nevertheless, in spite of the complexity of the problem, such good progress is being made towards its final solution that the more sanguine, at all events, may hope that there may come a time even in this world when moth and rust shall not prevail.—*The Gardeners' Chronicle.* November 3, 1923, p 255

CANADIAN HORTICULTURAL COUNCIL

REGULATIONS governing the establishment of official trial gardens or plots and demonstration gardens have been agreed upon by the directors of the Canadian Horticultural Council. The trial gardens will be established at government institutions only, such as experimental farms and agricultural colleges, and are for the purpose of testing the merits of new varieties of fruits and flowers originated in Canada with a view to registration. The demonstration gardens may be carried on by horticultural societies and similar organizations with the object of making known to gardeners and the public generally the qualities and characteristics of different varieties and strains of plants now in commerce. Already applications have been received for demonstration gardens for the iris at London and Brampton, the peony at Galt, the gladiolus at St. Thomas, the rose at Markham, and the dahlia at Mimico, in the province of Ontario.

Trial Gardens

The institutions selected for the establishment of official trial gardens, are the following:—

British Columbia.—University of British Columbia, Vancouver; Dominion Experimental Farm, Summerland.

Saskatchewan.—University of Saskatchewan, Saskatoon; Dominion Experimental Farm, Indian Head.

Alberta.—Dominion Experimental Farm, Lethbridge; University of Alberta, Edmonton.

Manitoba.—Manitoba Agricultural College, Winnipeg; Dominion Experimental Farm, Morden.

Ontario.—Ontario Agricultural College, Guelph; Ontario Experiment Station, Vineland; Central Experimental Farm, Ottawa.

Quebec.—Macdonald College, Ste. Anne de Bellevue; Dominion Experimental Farm, Lennoxville.

New Brunswick. Dominion Experimental Farm, Fredericton.

Nova Scotia.- Dominion Experimental Farm, Kentville.

Prince Edward Island.—Dominion Experimental Farm, Charlottetown.

Demonstration Gardens

The rules and Regulations adopted by the Council with reference to Demonstration Gardens contain the following provisions, namely:—

1 The Applicant shall provide:

(*a*) A site satisfactory for the purpose;

(*b*) Experienced gardener or gardeners to assure grounds being kept in proper condition;

(*c*) Every possible precaution to prevent injury or theft;

(*d*) To the Council, entry forms for each variety, properly completed by the donor;

(*e*) Records on forms provided by the Council;

(*f*) All funds for expenses entailed;

(*g*) Assurance that no advertising will be permitted on the grounds;

(*h*) Assurance that the gardens will not be commercialized in any manner;

(*i*) A Demonstration Garden Committee, the names of which shall be filed with the Council.

2. The Canadian Horticultural Council shall:

(*a*) Give full recognition and publicity to the recognized Demonstration Gardens and treat records and information obtained therefrom as authentic;

(*b*) Provide judges as required to score and classify the varieties;

(*c*) Provide at cost, standardized, permanent labels, indicating variety and name and address of donor.

Rules

(1) No new variety shall be accepted until it has been recorded by the Council. A new variety is one the name of which had not been accepted by a recognized society prior to May 1, 1923.

(2) Entries shall be made direct with the Secretary of the Demonstration Gardens.

(3) All flowers shall be rated according to the Council score card for the kind.

(4) All material will be returned at the end of the demonstration period, if desired, at owner's risk.

Fruits of Canadian Origin Recorded

The Canadian Horticultural Council has decided to officially record a number of varieties of fruits that had their origin in Canada and are well established commercial varieties. They are as follows: The McIntosh and Fameuse apples; the Fitzgerald peach; the Windsor cherry; the Herbert raspberry; the Hilborn black raspberry; the Josselyn gooseberry, and the Saunders black currant.

LIST OF RECORDED VARIETIES

Class of plant	Name	Origin and description	Originator	Address
Black Raspberry.	Hilborn ..	Originated by W. W. Hilborn, Arkona, Ont. Fruit medium to large, black, glossy, with a little bloom; firm, juice, sweet, good flavour; quality very good; season medium. Plant vigorous, hardy, productive. One of the hardiest and best varieties.	W. W. Hilborn .	Arkona, Ont.
Gooseberry.. .	Josselyn .	Originated about 1870; named Red Jacket, but, as there was already an English variety under this name, it was renamed Josselyn by Geo. S. Josselyn, Fredonia, N.Y. A cross between Houghton and Red Warrington. Fruit larger than Downing, roundish to oval green, more or less covered with coppery red; smooth; sub acid; sprightly; good flavour, good quality; season medium	Dr. Wm Saunders (deceased)	Experimental Farm, London, Ont.
Raspberry	Herbert..	Originated as a chance seedling in 1887. Thought to be a seedling of Clarke. Fruit large to very large, obtusely conical, bright to rather deep red, moderately firm, sweet and subacid, sprightly, good flavour. Quality very good; season medium.	R. B Whyte	Ottawa, Ont.
Apple	McIntosh Red..	Originated as a chance seedling in 1796. Propagation begun in nursery by Allan McIntosh, Dundela, Ont., about 1870. Fruit above medium size, roundish, yellow almost or quite covered with crimson, subacid, sprightly, aromatic. Quality very good. Season November to February or later.	John McIntosh.	Matilda Tp., Dundas Co., Ont.
Black Currant.	Saunders.. .	Originated about 1870. A seedling of Black Naples Seedling. Fruit above medium to large. Skin thick; briskly subacid; quality medium; season medium. A strong grower and very productive. One of the best commercial varieties.	Late Dr Wm. Saunders.	London Ont.
Peach .	Fitzgerald.. .	Originated in the garden of Mr. Fitzgerald about 1895. Fruit medium to large; form roundish ovate; colour bright yellow covered with deep red; freestone, flesh yellow, red at pit; texture tender and juice; flavour good; quality good; season early to mid-September. Hardier than some others.	Mr Fitzgerald..	Oakville, Ont.
Cherry	Windsor	Originated on the farm of Jas. Dougall, Windsor, Ont. First exhibited by the originator at the summer meeting of the Fruit Growers' Association of Ontario in 1871. A sweet cherry of the Bigarreau type. Fruit dark red; turning almost black; oblong to conical; compressed, of large size, firm flesh, sweet and of good quality. Season medium to late.	Jas. Dougall	Windsor, Ont.
Apple..............	Fameuse. .. .	Origin obscure but it is generally believed that seed was brought from France by the early settlers of Canada and from this seed originated the Fameuse known also as Snow and Chimney apple. Fruit medium size, roundish, yellow almost or completely covered with deep red or striped with red. Flesh white, very tender, subacid, with a fine flavour. Quality very good. Season October to February.		

Recorded New Varieties

On the recommendation of the Plant Registration Committee the following new varieties of plants of Canadian origin have been accepted for recording. They will be subjected to official test in the Trial Gardens provided for the purpose and will afterwards, if satisfactory, be granted registration.

LIST OF RECORDED VARIETIES (NEW)

Class of plant	Name	Origin and description	Originator	Address
Rose......... .	Agnes	Cross between Rosa Rugosa (f.) and Persian Yellow (m.); habit, texture and colour of leaves resemble Rosa R. Flower double, pale amber, fragrant, blooms early but only once in a season. Form of bud good. Quite hardy at Ottawa.	Late William Saunders.	Experimental Farm, Ottawa.
Gladiolus	Sarah Wood	Large bright red flower, silvered inside; straight stem; vigorous.	Miss Nellie M. Stockford.	Guelph, Ont.
Gladiolus...........	Lauretta Peer.	Seedling, parentage unknown. Light purple, deep purple way back in throat, mid vein on petals lighter. About 15 flowers to a spike, closely arranged.	J. Wesley Peer..	Lorne Park, Ont.
Gladiolus...... .. .	John Wesley..	Seedling, parentage unknown. Three cornered petals, salmon pink, suffused with deep red inside, mid-vein light. Flowers large, about 5½ inches across, 16 to 17 being borne on vigorous spike.	J. Wesley Peer...	Lorne Park, Ont.
Gladiolus	Lady Byng..	Cross between Primulinus and America, seedling. Pure shell pink flowers, delicately tinged with lemon yellow. Flowers 4½" to 5½" in size, about 12 to spike.	Archibald....Gilchrist	Islington, Ont.
Strawberry...	Scugog .	Cross between Rango (a seedling raised by Mr. Crawford) and Bubach. Heavy cropper, good colour, very little core, solid centre, flavour fair.	Charles Byron Crawford.	Cooksville, Ont.
Chrysanthemum	Lady Byng..	White Mensa crossed H. Marie Tetty, originated in the Horticultural Division, Ottawa, 1921. Single pink with white centre, petals somewhat twisted or cactus-like, good stem.	Horticultural Division.	Experimental Farm, Ottawa.
Chrysanthemum.....	J. R. Booth....	A sport of Nag-ir-roc and same shape. An exhibition variety double, reflexed, lemon yellow in colour; flowers 9" across and about 7" deep.	Horticultural Division, 1919.	Experimental Farm, Ottawa.

The Plant Registration Bureau is maintained at the headquarters of the Canadian Horticultural Council at Ottawa, under the supervision of L. F. Burrows, secretary of the Council.

ACCREDITED HERD REGISTER

Supplementary List

DURING the months of November and December, 1923, fully accredited herd certificates were issued to the following:

PRINCE EDWARD ISLAND

AYRSHIRE

Prowse, Mrs. E. A., Winslow Station.

HOLSTEIN-FRIESIAN

Callbeck, Howard, North Tryon.
McNutt, J. Wallace, Darnley.

SHORTHORN

Simpson, John, Hamilton.

NEW BRUNSWICK

AYRSHIRE

Dickson, H. V., Hammond River.

HOLSTEIN-FRIESIAN

Stockton, R. A., Sussex.

QUEBEC

AYRSHIRE

Arthur, Robt. A., Huntingdon.
Bazinet, J. L., St. Paul de Joliette.
Bruce, A. A., Huntingdon.
Crittenden, A., West Brome.
Edwards, B. A., Lacolle Junction.
Hawkins, W. J., Hemingford.
Mousseau, J. B., Berthierville.
McGrandel, W., Arundel.
Nadeau, Desire, St. Paul.
Perreault, Camille, Joliette.
Pettes, Mrs. J. M. & Son, West Brome.
Stark, Andrew, Huntingdon.
Stark, T. B., Huntingdon.
Tourigny, John, Bécancour.
Wadey, C. A., Abercorn.

CANADIAN

Cayouette, J. L., Bromptonville.
Bazinet, J. L., St. Paul de Joliette.

HOLSTEIN-FRIESIAN

Deland, Henri, L'Acadie.
Frost, E. I., Ayer's Cliff.
Healy, W. H. & Son, Richmond
Hillhouse, A. P., Foster.
Jackson, Woodward, Franklin Centre.
Pope, A. L., Coaticook.
Vaughan, E. L., Compton Station.

JERSEY

Burton, Edward, Lennoxville.
Emerson, W. H., Sutton Junction.
Healy, Ernest E., Richmond.
Healy, W. H. & Son, Richmond
Hunting, W. H. & Son, Lennoxville.
McCullagh, C. W., Tomifobia.
Pope, A. L., Coaticook.
Sheperd, C. W., Knowlton.

SHORTHORN

Pickel, T. P., Cowansville.
Woodward, J. R., Lennoxville.

ONTARIO

AYRSHIRE

Hudson, J. & Son, Lyn.
McVicar Bros., Belmont.
Roberts, H. L., Simcoe.
Turner, E. A., St. Pauls.

GUERNSEY

Roselawn Farm, Roche's Point.

HOLSTEIN FRIESIAN

Atkins, F. L., Putnam.
Bilton, J., Hagersville.
Campbell, J. R., Stouffville.
Cherry, W. H., Hagersville.
Couch, Norman W., Smiths Falls.
Cumming, Dougall, Russell.
Durham, G. W., St. George.
Everett, L. A., Simcoe.
Fich, Peter B., Point Rowan.
Foran, T. W., St. George.
Gill, Gleason, Russeldale.
Hartley, Stephen, Woodstock.
Hubbs, Fred H., Bloomfield.
Kaufman, J. C., Bright.
Leslie, G. P., Oakville.
MacDonald, Hubert, Bloomfield.
McIntosh, John E., Vankleek Hill.
McKay, D. J., Scier[illegible] Hill.
Mason, Mrs. W. E., Simcoe.
Moerschfelder, L. C., Selkirk.
Moore, J. J., Waterford.
Moyer, Harvey W., Markham.
Park, A. C., Listowel.
Patten, W., St. George.
Robb, G. B., Branchton.

Smith, A. R., Waterford.
Starling, Edward, St. Williams.
Thistle, Harold, St. Pauls.
Tierney, Herman J., Metcalfe.
Tufford, R. E., Norwich.
Turner, J. E., Carlingford.
Wilson, J. Harley, Hamilton.

JERSEY

Arnott, H. H., Brampton.
Colton, H., Malton.
Latsch, Geo. W., Kitchener.

SHORTHORN

Gowan, E. W., Jarvis.

MANITOBA

ABERDEEN-ANGUS

Patterson, Thos., Rosebank.

HERESFORD

Brigham, Richard, Deleau.
Garland, W. P., Carberry.
Robinson, H. E., Carman.

HOLSTEIN-FRIESIAN

Wilton, T. J., Roland.

SHORTHORN

Evans, P. D., Killarney.
Forder, W., Pipestone.
Grant, W. L., Lenore.
Kahler, C. & Son, Moline.
Laycock, Thos., Rosebank.
Lelond, W., Sr. Miniota.
Paterson, D., Berton.
Sinclair, G. W., Elkhorn.
Sinclair, W. H. C., Swan River.

SASKATCHEWAN

SHORTHORN

James, E. A., Semans.
Watson, W. P., Dalesboro.

ALBERTA

AYRSHIRE

Standish, Jos., Calgary.

HOLSTEIN-FRIESIAN

Burns, J. W. C., Spruce Grove.

SHORTHORN

Shuttleworth Bros., Beddington.

BRITISH COLUMBIA

GUERNSEY

Bazette, W., Duncan.
Chorlton, P., New Westminster.

HOLSTEIN-FRIESIAN

Brown, H. W., Cloverdale.
Chorlton, J., New Westminster.
Lloyd, F. & Gainsford, J., Westholme.

JERSEY

Lloyd, F. & Gainsford, J., Westholme.

CERTIFICATES CANCELLED

The following certificates have been cancelled:

ONTARIO

Fargo, Wm., Ayrshire.
McRae, Geo. A., Holstein.
Phillips, J. J., Holstein and Grades.
Roy, D., Ayrshire and Grades.
Slack, A. C., Holstein.
Stevens, W. C., Holstein.

QUEBEC

Fowler, H. W. & O. A., French Canadian.
Taylor, B. J., Ayrshire.

MANITOBA

Leader, Harry, Aberdeen-Angus and Grades.
Parish, W. L., Aberdeen-Angus.
Stewart, D., Shorthorn.

BRITISH COLUMBIA

Bevan, W. H., Jersey.

ANNUAL REPORT ON FIELD CROPS OF CANADA, 1923

THE Dominion Bureau of Statistics has issued the final report on the area, yield, quality and value of the field crops of Canada for the year 1923. The total area under field crops in 1923 was 56,569,794 acres as against 57,189,681 acres in 1922. The aggregate value of all field crops in 1923 is $891,755,200, as compared with $962,293,200 in 1922, a decrease of $70,538,000, caused mainly by lower prices applicable almost to every crop. The hay and clover crop alone however accounts for a decrease of $32,068,000, the average price per ton having fallen from $13.46 to $10.97.

Areas and Yields of Grain Crops

The total yield of wheat in Canada for the year 1923 is finally estimated at 474,199,000 bushels from an area of 22,671,864 acres, as compared with 399,786,400 bushels from 22,422,693 acres in 1922 and with 269,233,910 bushels from 20,079,832 acres, the annual averages for the five years 1918-22. The total for 1923 consists of 19,315,000 bushels from 815,706 harvested acres of fall wheat and of 454,884,000 bushels from 21,856,158 sown acres of spring wheat. The total wheat crop of 474,199,000 bushels as now finally estimated is the largest on record for Canada, and compares with 399,786,400 bushels, last year's record crop, and with 393,542,600 bushels, the previous record crop of 1915. The average yield per acre for all wheat in 1923 is 21 bushels, as compared with 17¾ bushels in 1922, and with 13½ bushels, the five-year average (1918-22), and with 26 bushels, the record for 1915. For fall wheat the average yield per acre in 1923 is 23¾ bushels against 21¼ bushels in 1922 and 22¼ bushels, the five-year average. For spring wheat the average for 1923 is 20¾ bushels, as compared with 17¾ bushels in 1922 and with 13 bushels, the five-year average. Oats yielded in 1923 the total of 537,733,300 bushels from 13,727,067 acres, as compared with 491,239,000 bushels from 14,541,229 acres in 1922, and with 453,776,220 bushels from 15,416,527 acres, the five-year average. The total for 1923 is the highest on record, the previous record being 530,709,700 bushels in 1920. The average yield per acre is 39¼ bushels, as against 33¾ bushels in 1922 and 29½ bushels, the five-year average. Barley yielded the total of 76,997,800 bushels from 2,784,571 acres, as compared with 71,865,300 bushels from 2,599,520 acres in 1922 and with 65,712,318 bushels from 2,749,165 acres, the five-year average. The average yields per acre were 27¾ bushels in 1923, 27¾ bushels in 1922, and 24 bushels, the five-year average. Flaxseed yielded in 1923 7,139,500 bushels from 629,938 acres, as compared with 5,008,500 bushels from 565,479 acres in 1922 and with 5,729,200 bushels from 937,605 acres, the five-year average. The yield per acre was 11·30 bushels in 1923 as against 8·85 bushels in 1922 and 6·10 bushels, the five-year average. For the remaining cereal crops the total yields for 1923 were in bushels as follows, the corresponding totals for 1922 and for the five-year average being shown within brackets: Rye 23,231,800 (32,373,400; 16,769,372); peas 2,898,200 (3,170,100; 3,437,576); beans 1,041,700 (1,303,300; 1,722,096); buckwheat 9,743,700 (9,701,200; 9,770,460); mixed grains 29,750,500 (27,707,700; 29,182,780); and corn for husking 13,608,000 (13,798,000; 14,836,500).

Root and Fodder Crops

The total yield of potatoes in 1923 was 56,460,000 cwt. from 560,942 acres, as compared with 55,745,300 cwt. from 683,594 acres in 1922 and with 67,680,880 cwt. from 744,801

acres, the five-year average. The average yield per acre in 1923 is 100½ cwt., as compared with 81·55 cwt. in 1922 and with 90¾ cwt., the five-year average. Turnips, mangolds, etc., gave a total of 38,211,600 cwt. from 194,512 acres in 1923, as against 43,973,500 cwt. from 224,256 acres in 1922 and 51,847,640 bushels from 276,910 acres, the five-year average. The yield per acre is 196½ cwt., as compared with 196·10 cwt. in 1922 and with 187¼ cwt., the five-year average. Sugar beets produced 216,200 tons in 1923 from 22,450 acres, as against 190,400 tons from 20,725 acres in 1922 and 258,160 tons from 25,576 acres, the five year average. The yield per acre was 9·60 tons in 1923, 9·20 tons in 1922 and 10·10 tons the average. Of hay and clover the total yield was in 1923, 14,844,900 tons from 9,725,602 acres, as compared with 14,488,200 tons from 10,001,667 acres in 1922, and with 14,062,660 tons from 10,427,182 acres, the average. The yields per acre were 1·55 ton in 1923, 1·45 ton in 1922 and 1·35 ton, the average. Grain hay yielded 4,336,100 tons from 1,920,432 acres, an average yield per acre of 2¼ tons. Of alfalfa the total yield in 1923 was 1,028,600 tons from 391,116 acres, as compared with 806,400 tons from 305,933 acres in 1922, and with 598,598 tons from 246,336 acres, the average. The yield per acre was 2 65 tons in 1923, 2·65 tons in 1922, and 2·45 tons, the average for the five years. Fodder corn yielded 5,320,800 tons from 659,070 acres in 1923, as against 5,879,000 tons from 654,624 acres in 1922 and 5,522,522 tons from 568,567 acres, the five-year average. The yield per acre was 8·10 tons in 1923, 9 tons in 1922 and 9·70 tons, the average for the five years.

Grain Yields of the Prairie Provinces

The total grain yields in the three Prairie Provinces (Manitoba, Saskatchewan and Alberta) are finally estimated as follows: Wheat, 452,260,000 bushels from 21,665,276 acres (375,194,000 bushels, 21,223,448 acres in 1922); oats 365,491,800 bushels from 8,372,081 acres (289,660,000 bushels, 8,564,212 acres in 1922); barley 59,778,200 bushels from 2,180,472 acres (53,612,000 bushels, 1,983,292 acres in 1922); rye 20,842,000 bushels from 1,303,210 acres (29,429,000 bushels, 1,926,117 acres in 1922); flaxseed 7,044,800 bushels from 620,172 acres (4,901,700 bushels, 555,043 acres in 1922).

Quality of Grain Crops

The average weights in pound per measured bushel for all Canada are as follows, the averages for 1922 and for the five years 1918-22 being given with brackets: Fall wheat 60·23 (59·91; 60·24); spring wheat 58·55 (60·31; 58·94); all wheat 58·80 (60·24; 59·25); oats 35·55 (35·68; 34·81); barley 47·19 (47·66; 46·98) rye 54·61 (55·71; 55·38); peas 60·00 (60·08; 59·90); beans 59·09 (59·39; 59·42); buckwheat 47·80 (47·80; 47·55); mixed grains 44·19 (44·33; 44·36); flaxseed 54·63 (55·04; 54·61); corn for husking 55·29 (55·45; 55·36). The weights of wheat and rye are below both those of 1922 and also of the average; but other grains are about equal to the average.

Values of Field Crops

The average prices per unit, as received by farmers in 1923, are estimated from the reports of crop correspondents for all Canada as follows, the corresponding prices for 1922 and for the five-year average 1918-22 are given within brackets: Per bushel: Fall wheat 92 cents ($1.01; $1.63); spring wheat 66 cents (84 cents; $1.36); all wheat 67 cents (85 cents; $1.37); oats 33 cents (38; 56); barley 42 cents (46; 79); rye 48 cents (58; 91); peas $1.72 ($1.84; $2.47); beans $2.66 ($2.85; $4.33); buck-

wheat 84 cents (84; $1.24); mixed grains 59 cents (60; 95); flaxseed $1.75 ($1.72; $2.50); corn for husking 92 cents (83; $1.18). Per cwt: Potatoes $1.01 (90 cents; $1.43); turnips, mangolds, etc. 59 cents (54; 79): Per ton: Hay and clover $10.97 ($13.46; $19.78); alfalfa $11.54 ($12.77; $18.76); grain hay $3.47 ($12.88, 1922); sugar beets $6.48 ($7.88; $10.05).

The total values of field crops in 1923 are estimated as follows, the corresponding values for 1922 and for the five-year average 1918-22 being given within brackets: Wheat $316,606,700 ($339,419,000, $369,822,400); oats $177,704,400 ($185,455,000; $252,084,020); barley $32,055,700 ($33,335,300; $52,223,964); rye $11,246,900 ($18,703,200; $15,231,350); peas $4,987,400 ($5,818,200; $8,486,060); beans $2,773,000 ($3,713,800; $7,457,280); buckwheat $8,191,700 ($8,140,800; $12,157,500); mixed grains $17,654,800 ($16,500,700; $27,628,004); flaxseed $12,517,900 ($8,638,900; $14,328,000); corn for husking $12,466,000 ($11,509,700; $17,480,580); potatoes $57,076,800 ($50,320,000; $96,680,080); turnips, mangolds, etc., $22,650,100 ($23,886,000; ($41,185,960); hay and clover $162,882,000 ($194,950,000; $278,174,180); alfalfa $11,872,000 ($10,295,000; $11,231,480); grain hay $15,063,800; fodder corn 24,605,000 ($29,197,600; $36,279,600); sugar beets $1,401,000 ($1,500,000; $2,594,340).

COMMERCIAL FRUIT PRODUCTION OF CANADA

THE following information as to production and value of the commercial fruit crops of Canada is supplied by the Dominion Bureau of Statistics:

PRODUCTION AND VALUES, 1923

Class	Quantity	Value
Apples	4,063,719 barrels	Not yet estimated.
Pears	227,335 bushels	$ 550,587
Plums and prunes	348,482 "	696,964
Peaches	403,660 "	916,050
Apricots	32,850 "	....
Cherries	203,125 "	722,440
Strawberries	8,652,200 quarts	1,513,230
Raspberries	4,496,840 "	1,044,000
Other berries	2,527,700 "	494,691
Grapes	42,185,077 lbs.	2,742,030

Values, 1921 and 1922

The total estimated value of commercial fruit produced, based on average wholesale market prices, is $45,262,788 for 1921 and $33,899,121 for 1922.

By provinces, the total values in 1922 are as follows:

Ontario	$ 14,295,140
British Columbia	9,181,902
Nova Scotia	7,947,118
Quebec	1,579,368
New Brunswick	895,593

Province		Apples	Pears	Plums and Prunes	Peaches	Apricots
		bbls.	bush.	bush.	bush.	bush.
Ontario	1923	1,304,400	112,000	83,100	332,860	......
	1922	1,739,000	336,000	167,181	501,764	
British Columbia	1923	1,124,933	94,835	265,382	70,800	32,850
	1922	1,027,333	102,727	241,257	75,797	37,766
Nova Scotia	1923	1,500,000	20,500			.
	1922	1,891,852	22 500			
Quebec	1923	65,094	..			..
	1922	216,984				
New Brunswick	1923	69,292				
	1922	173,236				

Province		Cherries	Strawberries	Raspberries	Other Berries	Grapes
		bush	qts	qts	qts	lbs.
Ontario	1923	103,125	3,607,200	840,000	950,000	42,185,077
	1922	130,000	4,755,000	3 360,000	1,120,000	70,308,462
British Columbia	1923	100 000	3,900,000	3,360,765	1,141,200	
	1922	72,740	2,720,000	2,850,320	1,286,176	
Nova Scotia	1923		135,000	36 080	112,500	
	1922		128 000	33 081	108,273	
Quebec	1923		510,000	.		
	1922		403,000	.		
New Brunswick	1923		500 000	16,995	21,000	
	1922		672 000	28 324	23 100	

NEWS ITEMS AND NOTES

The figures for the total production of milk and its products in 1922 show a decrease in cheese as compared with 1921, but the increase of over 19,000,000 pounds in creamery butter is nearly double the decrease in cheese on a butter fat basis. There was a decrease in condensed milk and an increase in milk powder for 1922.

The total value in 1922 of all dairy products, with the value of dairy butter and milk consumed estimated, amounted to $193,000,000 in round figures, which is somewhat less than in 1921.

"The year 1923 will be looked back upon as a milestone in the progress of Canadian dairying for the reason that systematic grading of all butter and cheese for export was inaugurated in that year. The work has been carried out with less difficulty than was anticipated, and in the light of the past year's experience and with some improvement in the regulations, we have reason to believe," states Commissioner Ruddick, "that in future the grading system will run even more smoothly than it has done so far. It is too early yet to talk much about results, and yet evidence can be produced to prove that there has been decided improvement in the quality of the cheese and butter in a great many cases, and that it was due to the grading is freely admitted by those most concerned."

The British Columbia Poultry Association at its annual Show at Victoria in December, inaugurated an egg-judging competition for children, which is probably the first contest of this kind held in the Dominion. Each competitor was given a dozen eggs to grade by the candling process. This was followed by an examination paper containing a number of questions relating to the work. The children showed much aptitude in distinguishing the several grades, and also wrote creditable examination papers. A similar competition will be conducted at the spring show.

Plans are now made whereby some 30 Illustration Stations in Nova Scotia and New Brunswick will this year propagate registered seed stocks under the supervision of Experimental Farms Branch officials. As an outcome of this project, it is expected that there will be achieved two fundamental objects, viz:

(1) A limited supply of pedigreed seed will be made available for distribution in the provinces concerned;

(2) A number of communities will be given a visual demonstration of the profitableness of sowing pedigreed seed and thus inaugurate seed growing centres.

The report of the Live Stock Commissioner for the province of Saskatchewan has been issued for the twelve months ending April 30, 1923, and covers the various phases of activity of the Branch for that period, as well as accounts of the work carried on by the Saskatchewan Live Stock Associations, the Live Stock Board, and the Western Canada Live Stock Union.

The Saskatchewan Live Stock Exhibit of 1923 made a good record for itself at the larger shows on this continent, and secured much valuable publicity both for individual breeders and for the province. The following were the prizes secured:

—	Royal Winter Fair, Toronto	The International Chicago
Grand Championships	4	1
Senior and Junior Championships ...	4	1
Canadian Bred Championship.		1
Reserve Championships .	5	1
Special Trophies ...	2	1
1st Prizes . .	23	4
2nd Prizes.. .	9	4
Other Prizes.. ..	28	27
Total . ..	75	40

At the Guelph, Ontario, Winter Fair, with a small exhibit, 14 prizes were won for cattle, sheep and horses, making a grand total at all three shows of 129 prizes.

During the month of December, 1923, 1,243 packages of nursery stock, valued at $60,000, and miscellaneous plant products to the value of $280,000, were examined by the Division of Foreign Pests Suppression, Dominion Entomological Branch.

The growing of the filbert nut has been receiving some attention in the province of British Columbia. To protect growers against the possible introduction of the filbert blight from Eastern Canada and from certain States of the American Union where it is found to exist, a regulation has been passed under the Destructive Insect and Pest Act to prohibit the entry into the province of British Columbia of plants or cuttings of all species, hybrids and horticultural varieties of hazel, cob or filbert nuts from Nova Scotia, Prince Edward Island, New Brunswick, Quebec and Ontario.

Peach orchards in the province of British Columbia are free from "peach yellows" disease, which has been responsible for much damage to orchards in the Niagara district of Ontario. To prevent the introduction of the disease into the Pacific Province, the importation into that province of all peach nursery stock, fruit pits or seeds from Eastern Canada and from certain states is prohibited by regulation under The Destructive Insect and Pest Act.

A regulation under the Destructive Insect and Pest Act has been passed by the Dominion Government to prevent the distribution of the White Pine Blister Rust into Western Canada. This disease was first found in America at Geneva, New York State, in 1906, and was not observed in Canada until eight years later. A survey soon discovered its presence on a wide scale in the Niagara Peninsula, and it has since been found in other parts of Ontario. This disease is particularly destructive to the white pine and drastic measures are necessary to keep it within reasonable limits. The regulation referred to prohibits the importation of certain species of pines and of currant and gooseberry plants subject to the disease into Alberta and British Columbia from all parts of the world and from the other provinces of Canada. There is no restriction, however, on the movement of the fruits of either currants or gooseberries.

The farms of Canada—including land, buildings, machinery, livestock, etc.,—constitute the largest item in Canada's national wealth, being valued by the Dominion Bureau of Statistics at $6,592,351,789 in 1921.

The Agricultural Representative for Northumberland county, Ontario, Mr. H. Sirett, reports that the County Council has made an appropriation for the purchase of 1,000 acres of land for the establishment of a reforestation area. The enterprise is to be undertaken in connection with the Department of Forestry of the Provincial Government.

According to Premier Bracken, weeds cost the farmers of Manitoba more than $20,000,000 annually.

At the Ottawa laboratory of the Dominion Seed Branch there is a well-equipped section for micro-analysis. Activities in this section have been directed mainly to the examination of ground feeding stuffs samples that are submitted by inspectors. The suspicion of adulteration of any feeding stuff may be confirmed by this new analytical service, and with most samples it is possible to make a quantitative determination that is reasonably accurate in point of percentage.

The Saskatchewan dairy industry made good progress in 1923, the creamery output for the year showing an increase of almost 20 per cent. One and three-quarter million pounds were shipped direct to British dealers, and all reports received were highly complimentary to the product. The aggregate value of the dairy products of the province in 1922 was $18,698,493.

The feeding of ensilage is one of the most important factors in reducing the cost of winter milk production, says the Saskatchewan Dairy Commissioner. A silo either above or below ground assures an abundance of cheap feed so essential to profits. There were 460 silos in the province in 1923, 167 of which were above ground

---

In spite of the rapid development of dairying in Saskatchewan, there are still not more than twenty-five per cent of the farmers of the province who are creamery patrons

---

The Saskatchewan Dairy Branch has co-operated with the Visual Instruction Branch of the Bureau of Publications for the Province in the preparation of three special dairy films entitled "Selection of a Dairy Cow," "The Trench Silo," and "Pure Bred Sires."

The Saskatchewan Dairy Association has done much to stimulate cow recording work by means of a competition known as the Greater Average Production Competition, among herd owners keeping production records. The winners are determined by figures recorded monthly in the office of the Dairy Commissioner. The fact that each year the production of the winning herd has been materially greater than the year previous, is evidence of the value of intelligent weeding out of unprofitable cows, as determined by the use of the scale and the Babcock tester.

The boys' and girls' dairy cattle judging competition, which has come to be recognized as one of the most important features of the Saskatchewan Dairy Convention, is this year being held for the seventh successive time.

Among the numerous other competitions arranged for at the convention is one in which prizes are offered for the best judge of ice cream. The competition for ice cream makers held last year will be repeated with a view to establishing a commercial standard.

The following extracts are from the 1923 Report of the Directors of the Dairymen's Association of Western Ontario:

"The dairy farmer is always assured of a cash income and a market for a first grade commodity irrespective of fluctuating or glutted markets for some other farm products.

"In the year 1922 Canada produced 135,-821,000 lbs. of cheese and 152,581,000 lbs of creamery butter; of this amount Ontario produced 92,709,000 lbs. of cheese and 51,-613,000 lbs. of creamery butter.

"Increased cheese production during the past season is noted while the output of creamery butter was probably equal to if not greater than that of 1922.

"Payment for milk on a quality basis not only provides an equitable method for the distribution of the proceeds from the sale of milk products but also tends to create a greater interest in cow testing which if persistently followed, insures improved herds, greater net profits per cow and a lower cost of milk production.

"The adoption of a uniform method for the payment for cream on a graded basis is the great problem before the creamery industry of Ontario. Compulsory cream grading has been accepted in every province with the exception of Ontario, but whether or not such a plan is feasible for this province has yet to be determined. An immediate improvement in quality has been obtained wherever efficient cream grading has been adopted, and there is every evidence available that the payment for cream on a quality basis is a sound foundation upon which to build and insure permanent improvement. Cream grading furnishes the incentive to the producers to care for the cream properly and to deliver it to the creameries sweet. Payment on grade standards, we submit, is of as great importance as the payment by grade for the finished product.

"Quality dairy products must be recognized by both producers and manufacturers as the foundation upon which we must build for the future if we are to maintain and eventually increase the desirable markets for our surplus dairy products. It has been repeatedly pointed out by many authorities that the export trade will readily absorb any surplus of No. 1 grade products but that it will be difficult in future to dispose of at a profit in any market low grade products."

One of the objects of the Dominion Illustration Stations is to serve as a source of production of high class seed and as a centre for its distribution, by sale, to farmers, and particularly to those in the neighbourhood of the Station. The varieties and strains that have proved most productive on the nearest Experimental Farm are grown at the Station, and thus made available to those who wish to secure a supply for seed purposes. The total amount of seed sold from the Illustration Stations in 1923 was as follows:

Seed oats, barley, wheat, potatoes, 18,732 bushels.

Grass and clover seed, 7,125 pounds.

APPOINTMENTS AND STAFF CHANGES

Mr. Geo. H. Barr has resigned his position as Chief of the Dairy Division of the Dominion Dairy and Cold Storage Branch, with which he has been connected for the past seventeen years, to engage in private business. Mr. Barr, who is well known to dairymen throughout the Dominion, did a great deal of useful work on behalf of the dairy industry during his connection with the Dairy Branch; notably in connection with the standardizing of practices in butter and cheese manufacture.

John M. MacCallum, B.S.A., of New Hamburg, Ontario, has been appointed Chief of the Stockyards Service, Dominion Live Stock Branch, to succeed D. Johnston.

F. T. Wahlen, D.Sc., has been promoted from Supervising Analyst to Chief Seed Analyst, Ottawa, succeeding A Eastham

---

Felix Charlan, Dominion Experimental Farms Branch, is resigning his position as Chief Officer of the Tobacco Division, Dominion Experimental Farms Branch, to accept a similar position in Argentina.

ASSOCIATIONS AND SOCIETIES

British Columbia Certified Seed Potato Growers' Association.—President, Geo. Stewart, Keatings, B.C.; Secretary, C. Tice, Department of Agriculture, Victoria, B.C.

Canadian Ayrshire Breeders' Association.—President, J. L. Stansell, Straffordville, Ont.; Vice-President, Frank Byrne, Charlesburg, Que.; Secretary, W. F. Stephen, Huntingdon, Que.

Canadian Council of Agriculture.—President, W. A. Amos, M.A., Palmerston, Ont.; Vice-President, Colin H. Burnell, Oakville, Man.; Secretary, J. W. Ward, 307 Bank of Hamilton Building, Winnipeg.

Canadian Florists and Gardeners Association.—President, S. Kirk, Georgetown, Ont.; Vice-President, T. Duggem, Brampton, Ont.; Secretary, H. J. Eddy, 4145 St. Catherine St., Montreal.

Canadian Kennel Club Inc.—President. Jos. Russel, 437 Jarvis Street, Toronto; Vice-President, H. Clayton, 2018 Queen St. E., Toronto; Secretary, Jas. D. Strachan, 34 Hambly Ave., Toronto.

Canadian Seed Growers' Association.—President, G. H. Clark, 114 Vittoria St., Ottawa; Vice-Presidents: Manitoba, T. J. Harrison, Manitoba Agricultural College, Winnipeg; P.E.I., W. H. McGregor, Central Lot 16; Quebec, R. Summerby, Macdonald College, P.Q.; Secretary, P. Stewart, 114 Vittoria St., Ottawa.

Canadian Silver Fox Breeders' Association.—President, J. A. Webster, Charlottetown, P.E.I.; Vice-President, P. G. Clark, Summerside, P.E.I.; Secretary, Jas. H. Prichard, Summerside, P.E.I.

Canadian Society of Technical Agriculturists.—President, H. Barton, Macdonald College, Que.; Vice-Presidents: E. A. Howes, University of Alberta, Edmonton; Jules Simard, Seed Branch, Department of Agriculture, Que.

Dominion Bantam Association.—President, Victor Barber, 890 College St., Toronto; Vice-President, T. J. Riley, 82 Thornton Ave., London, Ont.; Secretary, J. T. Isbell, 39 Woolfrey Ave., Toronto.

Eastern Ontario Poultry Association.—President, W. H. Carleton, 110 Stanley Ave., Ottawa; Vice-President, J. W. McKay, 120 Bayswater Ave., Ottawa; Secretary, B. Phelan, 415 Wellington St., Ottawa.

Gardeners and Florists Association of Ontario.—President, S. McIlroy, 139 Galley Ave., Toronto; Vice-President, T. Smith, 163 Silverthorne Ave., Toronto; Secretary, R. G. Thompson, 26 Alcina Ave., Toronto.

Maritime Poultry and Pet Stock Association.—President, S. E. McKie, 25 Birch St., Moncton, N.B.; Vice-President, Samuel Steeves, Sunny Brae, N.B.; Secretary, A. Vye Gibson, Main St., West Moncton, N.B.

Maritime Stock Breeders' Association.—President, A. E. Trites, Salisbury, N.B.; Vice-Presidents: Nova Scotia, S. A. Logan, Amherst; New Brunswick, G. P. C. McIntyre, St. John; Prince Edward Island, Jas. F. Roper, Charlottetown; Secretary, F. L. Fuller, Truro, N.S.

National Dairy Council of Canada.—President, E. H. Stonehouse, 186 King St. W., Toronto; Vice-President, F. M. Logan, Regina, Sask.; Secretary, D'Arcy Scott, Central Chambers, Ottawa.

New Brunswick Fruit Growers' Association.—President, W. B. Gilman, R.R. 6, Fredericton; Vice-President, A. R. Gorham, Greys Mills; Secretary, A. C. Turney, Fredericton.

Niagara Peninsula Growers Limited.—President, T. J. Mahony, R.R. 5, Hamilton, Ont.; Vice-President, A. A. Craise, R.R. 3, St. Catharines, Ont.; General Manager, C. W. Baxter, Grimsby, Ont.

Ontario Aberdeen-Angus Breeders' Association.—President, John McAllister, Guelph; Vice-President, R. H. McEwen, R. R. 4, London; Secretary, Jas. Bowman, Guelph.

Ontario Agricultural and Experimental Union.—President, J. Baker, Hampton; Vice-President, Wm. Elliott, Galt; Secretary, C. A. Zavitz, O.A.C., Guelph.

Ontario Apple Shippers' Association.—President, W. J. Bragg, Bowmanville; Vice-President, B. H. Coyle Colborne; Secretary, R. B. Scripture, Brighton.

Ontario Beekeepers' Association.—President R. G. Houghton, Barrie; Vice-President, Morley Pettit, Georgetown; Secretary, F. Eric Millen, O.A.C., Guelph; 2nd Vice-President, John A. McKinnon, Vankleek Hill, Ont.

Ontario Beet Growers' Association.—President, H. J. French, Dresden; Vice-President, Leo O'Neil, Wallaceburg; Secretary, J. L. Dougherty, Chatham.

Ontario Fruit Growers' Association.—President, Paul Fisher, Burlington; Vice-President, Howard Leavens, Bloomfield; Secretary, P. W. Hodgetts, Parliament Bldgs., Toronto.

Ontario Hereford Breeders' Association.—President, J. E. Harris, Kingsville; Vice-President, Edgar J. Hopper, St. Marys; Secretary, A. L. Currah, Bright.

Ontario Veterinary Association.—President, T. B. Buckley, 336 Dundas St. E., Toronto; Vice-President, J. Dunn, Barrie; Secretary, J. S. Glover, Walmer Road and Bridgeman St., Toronto.

Prince Edward Island Ayrshire Breeders' Club.—President, J. A. Clark, Charlottetown; Vice-President, T. A. Rodd, Winsloe; Secretary, Earle McRae, New Wiltshire.

Prince Edward Island Dairymen's Association.—President, J. H. Simpson; Vice-President, J. S. Cousins; Secretary, J. F. Profitt, Kensington.

73638—5

Prince Edward Island Potato Growers' Association.—President A. E. Dewar, Charlottetown; Vice-President, W. H. McGregor, Central Lot 16; Secretary, W. Boulter, Charlottetown.

Poultry Producers' Association of Ontario.—President, Lewis N. Clark, Port Hope; Vice-President, Colonel Delemere, Stratford; Secretary, C. M. Goddard, Britannia Heights, Ont.

Provincial O.A.C. Alumni Association. President, S. E. Todd, 186 King St. W., Toronto; Vice-President, J. B. Fairbairn, Beamsville, Ont.; Secretary, R. S. Duncan, Parliament Bldgs., Toronto.

Quebec Poultry and Pet Stock-Breeding Syndicate Limited.—Secretary-treasurer, P. E. Aird, 293 West Notre Dame, Montreal.

Saskatchewan Dairy Association.—President, J. A. Caulder, Moose Jaw; Vice-President, J. A. Smith, Duff; Secretary, P. E. Reed, Dairy Branch, Department of Agriculture, Sask.

Saskatchewan Stock Growers' Association.—President, Olaf Olafson, Mortlach; Vice-President, R. P. Gilcrist, Vidora; Secretary, Edward Evans, Moose Jaw.

Southern Alberta Sheep Breeders' Limited.—President, C. Jensen, Magrath; Vice-President, J. E. Neilson, Cardston; Secretary, N. T. MacLeod, Lethbridge.

Tamworth Breeders' Club.—President, G. German, St. George, Ont.; Secretary, W. J. Alexander, Georgetown, Ont.

United Farmers of New Brunswick.—President, J. W. Caldwell, Florenceville; Vice-President, J. F. Reilly, Melrose; Secretary, C. Gordon Sharpe, Pembroke, N.B.

United Farmers of Ontario.—President, W. A. Amos, Palmerston; Vice-President, Harold Currie, Strathroy; Secretary, J. J. Morrison, 109 George Street, Toronto.

United Farm Women of Ontario.—President, Mrs. J. S. Amos, R. R. No. 5, Woodstock; Vice-President, Mrs. Harold Currie, Strathroy; Secretary, Mrs. H. L. Laws, Cayuga.

United Grain Growers Limited.—President, Hon. T. A. Crerar, Winnipeg; Vice-President, C. R. Jones, Winnipeg; Secretary, R. S. Law, Winnipeg.

Veterinary Association of Saskatchewan.—President Dr. N. Wright, Saskatoon, Sask.; Vice-President, Dr. H. Richards, Indian Head, Sask.; Secretary, Dr R. G. Chasmar, Hanley, Sask.

Western Grain Dealers' Association.—President, H. O. Heimbecker, 604 Lancaster Bldg., Calgary; Vice-President, C. W. Roenisch, 706 Lancaster Bldg., Calgary; Secretary, D. O. McHugh, 701 Lancaster Bldg., Calgary.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Experimental Station, Ste. Anne de la Pocatiere, Que., 1922.—Report of the Superintendent, J. A. Ste Marie, B.S.A., Dominion Experimental Farms.

Division of Botany, 1922.—Report of the Dominion Botanist, H. T. Gussow, Dominion Experimental Farms.

Index to Seasonable Hints.—Complete from March, 1915, to November, 1923.

Mange in Horses, Cattle and Sheep.—Bulletin No. 31—New Series. By Geo. Hilton, V.S., Chief Veterinary Inspector, Health of Animals Branch.

Fertilizer Samples, 1922-23.—Report of Official Analyses under the Fertilizers Act, 1922. By Grant S. Peart, B.S.A., Chief, Markets and Fertilizer Division. Seed Branch. Pamphlet No. 41—New Series.

Vat and Churning Numbers on Cheese and Butter Packages.—Circular No. 20. Dairy and Cold Storage Branch.

ONTARIO

A Few of the Leading O.A.C. Varieties of Grain Crops.—By Chas. A. Zavitz, B.S.A., D.Sc., Professor of Field Husbandry and Director of Plant Breeding and of Field Experiments. Ontario Agricultural College. Circular No. 42.

Annual Reports of the Dairymen's Associations of the Province of Ontario, 1921 and 1922.

QUEBEC

Les Semences de Grande Culture.—By L. Philippe Roy, B.S.A., Bulletin No. 82.

MANITOBA

Weeds of Manitoba.—Extension Bulletin No. 73. Superseding Extension Bulletin No. 30. By V. W. Jackson, Professor of Botany, Manitoba Agricultural College.

SASKATCHEWAN

Eleventh Annual Report of the Live Stock Commissioner for the Twelve Months Ended April 30, 1923.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

The new decalogue of science, by Albert Edward Wiggam. Indianapolis, Bobbs-Merrill co. 1923. 288 p.

Economic history of American agriculture, by E. L. Bogart. Toronto, Longmans, Green & co. 1923. 173 p. il

World weather, by H. H. Clayton. Toronto, Macmillan co. of Canada, 1923 393 p. il.

The air and its ways, by Sir Napier Shaw. Toronto, Cambridge university press, 1923 237 p. il.

Fresh water biology, by H. B. Ward and G. C. Whipple. New York, John Wiley & sons, inc 1918 1111 p. il.

Evolution by means of hybridization, by J. P. Lotsy. The Hague, Martinus Nijhoff, 1916. 166 p.

L'hérédité chez la betterave cultivée, par J. L. de Vilmorin. Paris, Gauthier-Villars et cie. 1923. 153 p. il.

Mankind at the crossroads, by E. M. East. New York, Charles Scribner's sons, 1923 360 p. maps, diagrams

The third-chromosome group of mutant characters of Drosophila melanogaster, by C. R. Bridges. Washington, Carnegie institution of Washington, 1923. 251 p. il. (Publication no. 327).

Genetic studies on Drosophila virilis with considerations on the genetics of other species of Drosophila, by C. W. Metz. Washington, Carnegie institution of Washington, 1923. 94 p. col. pls. (Publication no. 328).

Marketing poultry products, by E. W. Benjamin. New York, John Wiley & sons, inc. 1923. 328 p. il.

Live stock and farm mechanics, by J. H. Gehrs. Toronto, The Macmillan co. of Canada, 1922. 391 p. il.

The diseases of farm animals in New Zealand, by Lt. Col. H. H. Reid. Wellington, Whitcombe & Tombs, 1923. 567 p. il.

Herding and handling sheep on the open range in U.S.A. by M. A. Smith. Salt Lake City, Utah, 1918. 69 p. il

Gardening for the twentieth century, by Charles Eley. New York, E. P. Dutton & co. 1923. 256 p. il.

One garden, by D. H. M. Read. London Williams & Norgate, 1923. 315 p. il

The practical book of garden architecture, by Phebe W. Humphreys. Philadelphia, J. B. Lippincott co 1914 330 p. il

The cultivated evergreens, by L. H. Bailey. Toronto, Macmillan co of Canada, 1923 434 p. il

Marketing northwestern apples, by H. H. Maynard. New York, Ronald press, 1923 190 p. il.

The principles of insect control, by R. A. Wardle and Philip Buckle. Toronto, Longmans, Green & co. 1923. 295 p. il.

Entomologie économique; les problèmes modernes de la lutte contre les insectes et leur application en Suisse. Berne, Ernest Bircher.

Le commerce international des grains, par Paul Van Hissenhoven. 2d edition. Brussels, The author, 120 Avenue de Tervueren. 1923. 591 p. il tables, charts.

Foundations of agricultural economics, by J. A. Venn. Toronto, Cambridge university press, 1923. 389 p. il.

A handbook of the larger British fungi, by J. Ramsbottom. Toronto, Longmans, Green & Co. 1923. 222 p. il.

The anatomy and physiology of the seed plants, by R. E. Torrey. Amherst, Mass. Agricultural college, 1922 85 p.

73638—5½

Diseases of crop plants in the Lesser Antilles, by William Nowell. London, West India Committee, 1923. 383 p. il.

Linnaeus, by B. D. Jackson. London, H. F. and G. Witherby, 1923. 416 p. il.

The phylogenetic method in taxonomy, by H. M. Hall and F. E. Clements. Washington, Carnegie institution of Washington, 1923. 355 p. il. (Publication no. 326).

The influence of pedigree stock on ordinary farm animals, by Alfred Mansell. London, Journal of the farmers' club, 1923.

Canada and Newfoundland, edited by H. M. Ami. London, Edward Stanford, ltd. 1915. 1069 p. il. maps.

The economic resources of the Pacific northwest, edited by H. T. Lewis and S. I. Miller. Seattle, Lowman and Hanford co. 1923. 523 p il.

Bergey's manual of determinative bacteriology. Baltimore, Williams & Wilkins co. 1923. 442 p.

Precis de parasitologie, par E. Brumpt. Paris, Masson & cie. 1922. 1216 p. il.

Life, by Serge Voronoff. New York, E. P. Dutton & co. 1920. 160 p. il.

Nutrition; the chemistry of life, by L. B. Mendel. New Haven, Yale university press, 1923. 150 p. il.

Economic aspects of the Great Lakes—St. Lawrence ship channel, by R. S. McElwee and A. H. Ritter. New York, Ronald press co. 1921. 291 p. il.

Panama and its bridge of water, by Stella H. Nida. New York, Rand McNally & co. 1922. 208 p. il.

The micro-organisms of the soil, by Sir E. John Russell. Toronto, Longmans, Green & co. 1923. 183 p. diagrams.

The nature and properties of soils, by T. L. Lyon and H. O. Buckman. Toronto, Macmillan co. of Canada, 1923. 588 p. il.

Fertilizers, by L. L. Van Slyke. New York. Orange Judd co. 1912. 734 p. il.

The evolution of climate, by C. E. P. Brooks. London, Benn bros. ltd. 1922. 173 p.

Observations on milling, by E. S. Miller. Chicago, National miller, 1923. 128 p. il.

Shade trees in towns and cities, by William Solotaroff. New York. John Wiley & sons, inc. 1911. 287 p. il.

Garden construction, by T. G. W. Henslow. London, Odhams press, ltd. 1923. 285 p. il.

Food industries, by H. T. Vulte and S. B. Vanderbilt. Easton, Pa. Chemical publishing co. 1923. 323 p. il.

Inland traffic, by S. J. McLean. New York, Alexander Hamilton institute, 1917. 339 p.

Banking principles and practice, by S. L. S. Patterson. New York, Alexander Hamilton institute, 1917. 349 p.

Marketing methods, by R. S. Butler. New York. Alexander Hamilton institute, 1917. 346 p.

Advertising campaigns, by Mac Martin. New York, Alexander Hamilton institute, 1917. 338 p.

Advertising principles, by H. F. De Bower. New York, Alexander Hamilton institute, 1917. 330 p. il.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

ORIGINAL ARTICLE

THE NEW NITROGENOUS FERTILIZERS OF GREAT BRITAIN

By E. J. RUSSELL, Director of the Rothamsted Experiment Station

The new nitrogenous fertilizers were already known and studied to some extent in Great Britain even before the War, but they played no very great part in practical farming. In this there were two reasons. In the first place the British farmer relies very largely on live stock to supply his land with nitrogen. A large number of cattle, sheep and pigs are kept, and over most of the country the system of husbandry centres round the animals.

There are however certain directions in which the new are able to compete successfully with the older fertilizers, and these will be considered under the various heads.

Nitrate of lime

This substance has been tested at a large number of centres and has usually proved as effective as nitrate of soda. Sometimes the one and sometimes the other has proved the better; but on an average the difference has been slight. The most extensive trials are those started before the War. Some typical results have been as follows:

	Mangolds											
	Midland Agricultural College, Derby 1915				Gloucester						Reading 1909 strong loam	
					Cirencester				Calcareous soil			
	Light soil		Heavy soil		1909		1910					
	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt.	t.	cwt
Nitrate of soda	29	8½	30	14	29	14	32	4	25	11	34	18
Nitrate of lime	28	8	30	4¼	32	5	30	3	25	11	35	1
No nitrogenous top-dressing	20	10	25	18¼	23	11	28	0	21	19	23	3

	Potatoes							Barley		Wheat	
	Woburn 1909 Sandy loam		Devon light soil		Jersey (5 centres)	Aberdeen various cent. 1907 1909		Rothamsted 1909		Rothamsted 1910	
	Tons	cwt.	T.	cwt.	lbs. per perch	t.	c.	Grain bus.	Straw lbs.	Grain bus.	Straw lbs.
Nitrate of soda	15	9	10	15	221	9	5	48·1	3,882	27·0	3,760
Nitrate of lime	15	6	10	7	228	9	6	46·2	4,449	20·7	3,618
No nitrogenous top-dressing	14	12	9	18	195	8	6	28·7	2,619	15·4	1,526

In practice nitrate of lime still suffers somewhat from the disadvantage that it is apt to turn sticky in a moist atmosphere and that it must be conveyed in casks, a fact which necessarily adds to the cost of transport. Further, it is not suitable for the mixed or "compound" fertilizers which are very popular in Great Britain. It has, however, the great advantage of containing calcium in place of sodium, and is therefore of value in two sets of conditions in England.

1. On heavy soils, since it does not cause the deflocculation and therefore the stickiness or "unkindliness" to use the farmers' phrase, which is often brought about by the nitrate of soda.

2. On soils deficient in lime, of which there are large areas in England, particularly in the west, where the calcium, small though it be in quantity, nevertheless proves of high value.

In the writer's view there is a distinct future for nitrate of lime in Great Britain, not in supplanting, but in supplementing, nitrate of soda and sulphate of ammonia.

Nitrate of ammonia

This substance became available for British farmers immediately the war was over, although in anticipation of the event the Rothamsted Experimental Station had made enquiries and experiments as to its probable value as fertilizer. Next to urea it is by far the most concentrated nitrogenous fertilizer on the market. When pure it contains 35 per cent of nitrogen, equivalent to 42½ per cent of ammonia. Half of the nitrogen is in the form of nitrate which is immediately available for the needs of the crop, and the other half in the form of ammonia which comes into action somewhat later. Samples examined at Rothamsted have been about 96 per cent pure, the remainder being mainly moisture, in this case the nitrogen content is 33½ per cent.

Further, as the ammonia is combined in the form of nitrate it has no exhausting effect on the lime of the soil, so that it can be used where there is a shortage of lime and where, therefore, there is reason to believe that sulphate of ammonia would not be wholly suitable. It is also entirely suitable for general farm crops and is perhaps the quickest-acting top-dressing known, being even more soluble than sodium nitrate, and at the same time, as part of its nitrogen is in the form of ammonia it is not so liable to loss if wet weather sets in after it has been applied to the soil.

Like some other very soluble substances, ammonium nitrate is liable to attract moisture from the air, and some samples become unmanageable because they form a tough cake which cannot easily be broken and may become pasty. There are, however, several varieties or modifications of ammonium nitrate, and one of them is free from this objectionable property. It is obtained by re-crystallizing under special conditions. This non-deliquescent variety keeps quite well in a dry shed; some of it was stored in the manure shed at the Rothamsted farm for ten months without becoming unmanageable. But it is by no means clear that this result could always be obtained, or that sufficient of the non-deliquescent variety could with certainty be manufactured to meet the needs of the farmers.

In the case of any fertilizer in England it is necessary to enquire how it would behave in admixture with others, partly because as already stated, farmers prefer to buy mixed or "compound" manures, and partly because even when they buy the several substances themselves they prefer to put them on altogether as far as possible, in order to save labour, a very serious item on British farms where wages are much higher than in many parts of the Continent. In the case of nitrate of ammonia, this question would not usually arise, as the proper use of this substance is as a top-dressing.

It was found however, that should the necessity arise, nitrate of ammonia would quite well mix with superphosphate so long as this material was dry and in good condition, but that if damp, noxious brown fumes were given off, as might be anticipated.

As a top-dressing it had the effect in some instances of scorching the leaves of the young plants, particularly in the drier, and warmer parts of the country. At Rothamsted a crop of mangolds was injured in this way in 1914, the small crystals falling on the leaves yielded so strong a solution that the plants suffered considerably. In later experiments the material was applied in a fine interval during showery weather, with the result that it was speedily washed off the leaves and caused no damage at any time. In experiments in the North, where the conditions are moister and cooler, no bad effects were observed.

The results of the experiments showed that nitrate of ammonia behaved very like nitrate of soda for farm crops: for example, for mangolds it was more effective than sulphate of ammonia when reckoned on an equal nitrogen basis, probably, because part of its nitrogen is already in the form of nitrate; for wheat it is equally effective. For potatoes, however, it is more risky than sulphate of ammonia: it gave

as large a crop but induced the formation of a large growth of haulms which would be a disadvantage whenever there was much blight. The results at Rothamsted have been:

	Mangolds Tons per acre	Potatoes Tons per acre	Wheat			
			Bu. per acre		Total produce (including straw) lb. per acre	
			Expt. 1	Expt. 2	Expt. 1	Expt. 2
Basal dressing —						
Nitrate of ammonia	23.3	8.8	41.7	[illegible]7	8,1[illegible]0	7,830
+Sulphate of ammonia	18.6	8.[illegible]	41.3	40.1	8,180	7,[illegible]5
+No nitrogen	17.3	8.0	35.[illegible]	34.6	7,310	7,0[illegible]5

As compared with nitrate of soda it has sometimes proved more effective. Thus in an extensive series of twelve experiments on hay land carried out by Hendrick at Aberdeen during the years 1911-1914 the results were as follows:

	Cwt. of Hay per acre
Basal dressing Nitrate of ammonia	[illegible]
Nitrate of soda	53.8
No nitrogen	50

Similar results have been obtained with oats and also with mangolds. It is quite possible that nitrate of ammonia is really the most effective and most valuable nitrogenous manure we have. But as against this enormous advantage there is the serious risk of deliquescence, and until this is greatly reduced it is unlikely that nitrate of ammonia will find an important place in the market.

Urea

Urea is the most concentrated of all nitrogen compounds offered to the farmer. It has not been the subject of many field experiments in England, but whenever tested as a fertilizer it has proved to be of the same order of value as sulphate of ammonia and nitrate of soda. The difference between these two fertilizers is in any case not very great. If the nitrogen in nitrate of soda is valued at 100 that of sulphate of ammonia is usually worth 96 to the farmer.

But in British farming it is always necessary to take account of possible harmful effects on the soil. Urea is singularly free from these: it does not make heavy soil sticky as nitrate of soda does, nor does it remove lime from the soil as does sulphate of ammonia. The writer knows of no soils on which urea would be unsuitable. It mixes with practically every fertilizer and would cause a minimum of trouble to the manufacturer of mixed fertilizers and proprietary manures. Further, it does not wash out from the soil but is retained probably as well as sulphate of ammonia, in which respect it is superior to nitrate of soda which in very wet districts is liable to wash out.

So far as present evidence goes, and it seems quite sound, urea is more effective when drilled with the seed than when used as top dressing. The experimental results at Rothamsted have been:

	Barley				Potatoes
	1921		192[illegible]		1921
	Grain Bushels per acre	Straw Cwts. per acre	Grain Bushels per acre	Straw Cwts. per acre	Tons per acre
Basal dressing					
+Urea	34.0	23.4	3[illegible].4	21.8	[illegible].63
+Sulphate of ammonia	35.0	[illegible]3.5	3[illegible].3	20.3	[illegible].31
+No nitrogen	26.1	1[illegible].6	[illegible]	16.8	[illegible].00

The high percentage of nitrogen in urea gives it a great advantage wherever transport is an important consideration. For the export trade or for farms situated a long distance from rail or canal or wherever a long railway journey has to be made there is a considerable advantage in handling a manure containing 37 per cent of nitrogen as is the case with urea rather than in handling one containing only about half

this amount. Further, the freedom of urea from injurious secondary effects on the soil, to which reference has already been made, gives it special advantages wherever any such effects cause inconvenience to the farmer. If urea can be put on the English market at the same price per unit of nitrogen as sulphate of ammonia, it will undoubtedly prove a serious competitor. Even if it remained somewhat dearer there still remain distinct possibilities for it in cases where the lime-removing effect of sulphate of ammonia could not satisfactorily be remedied, and where nitrate of soda was unsuitable so long as the disparity of price was not too great.

Ammonium Chloride

For technical reasons ammonium chloride is one of the cheapest forms in which synthetic nitrogen can be put on the market.

On general grounds it would be supposed that the chloride and sulphate of ammonia must be of equal value as fertilizers. There is, however, much physiological evidence to the effect that the chloride under certain conditions may be harmful to plant growth. It by no means follows that this would happen in practice; whether it would or not can be ascertained only by trial. In view of the technical importance of the salt an extended investigation is being made at Rothamsted and at various centres in England under Rothamsted supervision.

The investigations proceed on two lines. Pot experiments are made to see whether the chlorine is exercising a harmful effect on the soil, or whether some of the soil constituents are mitigating or even suppressing the action.

Field experiments are made to discover to what extent field factors—such as subsoil, varying water supply, or indirect effects of ammonium chloride on the soil itself—influence the action of the fertilizer.

The pot experiments show conclusively that the chlorine ion has no visible toxic effect on the plant in soil *when all conditions are favourable to growth.* The chloride and the sulphate had at least equal value when compared on the basis of equal nitrogen content; indeed in the light soil the chloride usually proved the better.

Field experiments gave varying results. In many cases the chloride proved inferior to the sulphate, especially under rather dry conditions; in other cases there was no recognizable difference between the salts; while in a few cases the chloride appeared to give better results than the sulphate. It may of course be the case that this apparent beneficial action is simply the usual "scattering" of field trial results; this will become clear when more data have accumulated. But when the results are set out in detail there is a distinct suggestion that, in certain conditions, the chloride does in fact give better results than the sulphate. What these are can as yet only be conjectured and it is more profitable to await the results of further experiments.

There is, however, one objection to ammonium chloride which in some conditions might prove serious as it appears to increase the risk of loss by drainage. This action is more harmful than that of ammonium sulphate which leads to loss of lime and consequent acidity, because in the case of the sulphate, the calcium compound is certainly not harmful to the growing plant, while calcium chloride is injurious. The harmful effect could no doubt be reduced to a minimum by proper attention to time and method of application, and indeed it is a possible cause of the occasional beneficial results that have been noted above.

The field results have varied with the seasons. The season 1921 was hot and very dry.

In this year the nitrogen in ammonium chloride had approximately the value of 90, when that in ammonium sulphate was put at 100.

The season 1922 was cold and wet. The nitrogen in ammonium chloride, when that of the ammonium sulphate was put at 100, had the following values:—

For potatoes in 56 tests......	99
For mangolds in 18 tests....	98
For cereals in 2 tests: Grain...	99
Straw...	105

The result is so near to 100 that it might at first be supposed that the ammonium chloride was fully equal to ammonium sulphate as fertilizer. Closer examination of the figures shows, however, that one or two results step out very much from the average and raise the value above its true level. When a distribution curve is drawn it is clear that the peak comes somewhere about 96-99 and for the present it is better to take this figure rather than the crude average as expressing the value of nitrogen in ammonium chloride when that in ammonium sulphate is put at 100.

Some of the individual results are as low as 83-88: these are invariably obtained with potatoes grown without dung and with kainit or potassium chloride. It is not usual to grow potatoes without dung but if for any reason this were being done, it would apparently be inadvisable to use ammonium and potassium chlorides together as fertilizer.

It is at present difficult to say what future lies before ammonium chloride as fertilizer. Almost everything will turn on the price at which it can be sold; it is undoubtedly of great value to the farmer, and when its various effects on the soil and the plant have become better known it will be possible to set out the conditions under which it can be used to the maximum advantage.

Cyanamide

It is perhaps hardly necessary to refer to cyanamide here since its direct action as fertilizer is not as good as that of the other substances to which reference has been made, and it can be converted by the manufacturer without great difficulty into one or other of them. There can be little doubt that this is the wisest procedure.

SCIENCE AND PRACTICE OF AGRICULTURE

AGRONOMY

573.—The Minimum Temperature of Germination of Seeds.—Coffman, F. A., *Journal of the American Society of Agronomy*, Vol. XV, No. 7, pp. 257-270, bibliography. Albany, N.Y., 1923.

Little information apparently exists upon the subject of minimum temperatures of germination of seeds of most of our commonly grown plants. The author's objects in these experiments were to determine: (1) The minimum temperatures at which seeds of different common crop plants would germinate; (2) the minimum temperatures at which satisfactory percentages of germination may be expected and the variations between such temperatures in different crops; (3) whether lower temperatures than those commonly used in seed testing laboratories would be beneficial in the germination of seeds.

Seeds of different species germinate very differently at different temperatures. Within a given species, starchy seeds appear to be unable to resist low temperatures to the same degree as the more oily seeds, without injury and reducing germination percentages. All of the small grains will germinate at the temperature of melting ice. Oats appear to be more effected by low temperatures than the other small grains. The strength of germination under freezing conditions appear to be in the following order: barley, rye, wheat, oats. It has been noted that under field conditions spring barley and rye will germinate more quickly than spring wheat and oats during seasons of low temperatures. Of the sorghums, the softer and more starchy varieties appear less able to withstand low temperatures than the harder seed types. Of our commonly grown crops, the seed of alfalfa and the clovers will germinate more readily at low temperatures than any of the others. From the results obtained in these tests it appears that it would be advantageous to use lower temperatures for the germination of alfalfa, clovers, and cereals than those now employed in seed testing laboratories.

609.—The Effect of Potassium and Magnesium upon the Quantity and Quality of the Potato Crop.—Marholt, D., *Die Landwirtschaftlichen versuchs Stationem*, Vol. C., Part 6, pp. 315-340, bibliography. Berlin, 1923.

The author gives a summary of the literature (dating from the time of Liebig), that deals with the effect of magnesium upon plants, and then passes on to describe his own experiments made during the three-year period 1917-1919, in the field belonging to the Chemical Laboratory of Giessen (Germany), on an alluvial clay of great water retaining capacity. The objects of the experiments were to determine how far the quantity and quality of the crop were influenced by: (1) various magnesian salts; (2) the separate introduction of the chloride, sulphate and carbonate of magnesium into a complete fertilizer; (3) the application of the salts combined with green manuring such as hop clover (*Trifolium procumbens*); (4) fertilizers like those mentioned in 2 and 3 supplemented with stable-manure.

The mineral fertilizer was composed of: sulphate of ammonia (53 pounds nitrogen per acre); basic slag (100 pounds of phosphoric acid per acre) potassic and magnesian salts (90 pounds of oxide of potassium, or magnesium per acre). The stable manure was applied at the rate of about 35,000 pounds per acre.

The results obtained show that:

(1) The salts of magnesium present in the soil have no favourable effect upon potatoes; the salts containing chloride of magnesium decrease, as compared with a complete fertilizer, the starch content of the tubers.

(2) In fertilizers that do not include substances forming humus, magnesian salts have very little effect upon the potato crop. In many cases, the application of sulphate of potassium alone produces as large, or almost as large crops as are obtained with potassic salts. +magnesian salts. Sulphate of magnesium sometimes

increases the yield; the carbonate and chloride are both less effectual

(3) The effect of a complete mineral fertilizer is greatly increased by the addition of organic manure. Green manuring with hop clover considerably intensifies the favourable effect of a potassium-magnesian fertilizer, when the latter is applied in the form of sulphate. The absolute starch yield generally increases with the potato crop, but the starch content of the tubers is decreased by the green manure, especially if this is applied at the same time as a complete mineral fertilizer (nitrogen, potassium, sulphur). The percentage of starch in the potatoes is, on the other hand, slightly increased if sulphate of magnesium is also introduced. This percentage was 21.06 in the unfertilized plots; 19.52 in those receiving only green manure, 18 80 in plots with green manure + nitrogen + potassium (sulphate); 19.12 in plots with green manure + nitrogen + phosphorus + sulphate of potassium and of magnesium. On the other hand, the absolute amounts of starch in quintals per hectare were respectively. 6 76-7 10-33.22-35 04, and the yield of tubers was respectively: 47 7-54 1-262 8-272 6 bushels per acre

(4) The application of stable-manure increases the good effects of mineral fertilizer still more than green manure. A complete mineral fertilizer added to stable manure produces a crop of tubers 20 to 40 per cent higher than can be obtained when green manure is added to the organic manure, and 50 per cent higher if it includes the sulphates of potassium and magnesium. The effect of stable-manure upon the starch content of the tubers is similar to that of green manure.

The use of sulphate of magnesium as a fertilizer for potatoes is only to be advised when it is added to stable-manure applied at the same time as a complete mineral fertilizer.

361.—HENDRICK, J. Fertilizers before and after the War. Reprinted from *Transactions of the Highland and Agricultural Society of Scotland*, p. 22. Edinburgh, 1922.

Professor Hendrick reviews the position of the fertilizer industry from the year 1810 to the present time. He alludes to the dye and drug industries and points out that these do not give employment to more than a fraction of the labour required in the manufacture of fertilizers. Attention is drawn to the importance of the synthetic process for fixation of nitrogen. He considers that owing to competition amongst producers fertilizers will be cheap, also, that the variety is now greater than before and in consequence the farmer requires more knowledge respecting fertilizers and their uses.

611.—Seed Mixtures for Grasslands.—STAPLEDON, R. G., *Journal of the Ministry of Agriculture*, Vol. XXX, No. 2, pp. 130-142. London, May, 1923.

The author draws attention to the economic importance of selection of strain rather than depending only on species. This applies especially to white clover; the commercial Dutch should only be used on grassland reserved for two years for sheep grazing but white wild clover can be substituted on short duration grassland as it tends rapidly to form a dense sward. The respective values of early and late red clovers and imported cocksfoot are also indicated.

As regards the question of *complex or simple* seed mixtures, the author refers to three distinct objections to the former, viz. too much competition between the species, unsuitability of certain included species to particular conditions, and different requirements for germination. This points to the necessity for careful choice of mixtures.

Seed mixtures may be classified as follows: (*a*) Stubble; (*b*) one-year ley; (*c*) two-year ley, (*d*) three-year or upwards including permanent pasture.

Insufficient use is often made of stubbles. In Wales a plan has been adopted of sowing seeds with the cereals, solely for the purpose of providing autumn and winter keep until ploughing is begun. (Quick growing red clover and Italian rye grass have given the best results (13 pounds per acre is recommended, sown directly after the cereal and harrowed in at the same time).

The following standard mixtures give an idea of the seeding rates which are generally adopted.

One-year ley (*a*) For very heavy single hay crop —Perennial rye grass 14 pounds + late flowering red clover 4 to 6 pounds + alsike clover 1 to 2 pounds; (*b*) for stubble grazing and aftermath as for hay:—Italian rye grass, 14 pounds + broad red clover 4-6 pounds + alsike, 1-2 pounds; (*c*) general purposes:—Italian rye grass, 6 pounds + perennial rye grass 10 pounds + late flowering red clover 2-3 pounds + broad red clover, 2-3 pounds + alsike, 1 pound; (*d*) for conditions unfavourable to the rye grasses but very favourable to timothy grass: timothy 10 pounds + alsike 6 pounds or timothy 10 pounds + late flowering red clover 4 pounds + alsike 2 pounds.

Two-year ley: (*a*) for soils where perennial rye grass is known to hold well into the second year: perennial rye grass 14 pounds + late flowering red clover 4-6 pounds + alsike, 1-2 pounds + wild white

clover, ¼ to ½ pound; (*b*) for soils where cocksfoot contributes in the second year to a larger extent than the perennial rye grass: cocksfoot, 10 pounds + timothy, 4 pounds + late flowering red clover 4-6 pounds + alsike 1-2 pounds + wild white clover ¼ to ½ pound or in proportions of 8 pounds + 8 pounds + 3 pounds + 4-6 pounds + 1-2 pounds + ¼ to ½ pound respectively; (*c*) for soils especially adapted to timothy: timothy 10-12 pounds + alsike 4-4 pounds + wild white clover ¼ to ½ pound (As timothy flowers so much later than other grasses, a combination of rye grass is not here recommended). The above mixture is an exceptionally cheap one; (*d*) where it is necessary to rely chiefly on tall oat grass: Tall oat grass 16 pounds + late flowering red clover 4 pounds + alsike 1-2 pounds + wild white clover ¼ to ½ pound, or the same mixture, but with 8 pounds perennial rye grass and 8 pounds tall oat grass.

Long duration leys and permanent grass: (*a*) *for hay and pasture* —a simple mixture for a three-year old ley is given as follows. perennial rye grass 16 pounds + cocksfoot (New Zealand) 10 pounds + timothy (Scotch) 4 pounds + late flowering red clover 4 pounds + trefoil, 1 pound + wild white clover 1½ pounds. Where, however, trefoil is not forthcoming (under conditions of high rainfall and on new calcareous soils) the following is considered a "sensible mixture":—perennial rye grass, 12 pounds + cocksfoot (New Zealand) 8 pounds + timothy 4 pounds + late flowering red clover (Welsh) 4 pounds + alsike 1-1½ pounds + wild white clover ¼ to ½ pound.

(*b*) *For grazing only*: perennial rye grass 10-12 pounds + wild white clover 2-4 pounds (sown under about two pounds of rape per acre or without any covering crop). Mixtures including coarser grasses such as rough stalked meadow grass may also prove advantageous

In each case these mixtures would be most applicable to regions of high rainfall, and if intended for use in winter and early spring grazing the addition of a small quantity of cocksfoot, and timothy might perhaps serve a useful purpose.

388.—Influence of Vine Training on Fruit Production.—AUCHTER, E .C. and BALLARD, W. R., *Bulletin No. 260, University of Maryland Agricultural Experiment Station*, pp. 207-231, bibliography. College Park, M.D., 1922.

Records of yields obtained from different varieties of vines trained according to five systems at the University of Maryland Agricultural Experiment Station viz.—Single Stem Four Cane kniffen, Single Stem Two Cane kniffen, Two Wire Umbrella or Umbrella kniffen, Munson 3 wire cross-bar system, and the Fan.

Under Maryland conditions, The Single Stem Two Cane kniffen appears to be the most satisfactory method. Posts are set 24 feet apart 3 vines between each two posts and no vine nearer than 4 feet from any post. The lower wire is placed 2½ to 3 feet from the ground and the upper wire from 2 to 3 feet above the lower one. First year the cane is pruned back to two or three buds, and the shoots staked or allowed to trail. Second year, all canes but one are removed and this is cut back to two or three buds. Third year, all canes but one removed and this should be carried to top wire and secured; all shoots should be retained, the excess canes can be removed at the next pruning, giving the vines the advantage of their growth during the summer. Vines pruned thus, often have the most vigorous shoots near the head. Fourth year: two vigorous canes selected just below the lower wire and trained to right and left along the wire, shortening back to four buds, a similar system is followed along the upper wire shortening back to about 6 buds. Two more canes are cut back to spurs close to the main stem at each wire and only one or two buds left. From such renewal spurs, canes for training along the wires will be developed for the following year. All other canes should be removed Fifth year, training similar to fourth year system. In selecting the canes it is advisable to choose the round, medium sized ones, with average internodes and round buds. It will probably be profitable to select spurs on wood older than two years as shoots on such wood seldom bear fruit and will make good fruiting canes the next year Canes on the upper wire should be cut back to about 10-12 buds and the forthcoming fruit bearing shoots allowed to droop down without tying The number of buds to leave each year will depend on several factors but good vigorous, mature vines growing on average soil should show 30 to 40 buds *i.e.* 60 to 80 clusters of grapes

The yields obtained per acre are distinctly higher with this system and with the others giving high grade fruit. The Munson system also gave good yields but the additional expense and time required for erecting the trellis, and the greater difficulties of picking and spraying make this method inferior. The three other less profitable systems of training are also described in detail, also several other less common methods applicable to weak growing varieties, when it is an advantage to train the shoots upright.

LIVE STOCK AND BREEDING

682.—The Feeding Value of Oat Straw. —Collins, S. H., *The Journal of the Ministry of Agriculture.* Vol. XXIX, No. II, pp. 993-997, bibliography, London, 1923.

Experiments have been carried out since 1920 at Armstrong College, Newcastle upon Tyne (England) with the two-fold object of determining the effect of natural causes in producing variations in the feeding value of oats, and of discovering the conditions necessary for the production of straw with a high nutritive value.

Starch is the principal carbohydrate found in straw and all the nitrogenous substances present are of great importance, since the proportion of non-albuminoid nitrogenous matters is very low.

An analysis of the straw harvested in 1919, 1920 and 1921, gave some indication of the effect of fertilizers on the feeding value of oat-straw. When a large amount of organic nitrogenous manure was used, the albuminoid content of the straw was 1.27 per cent higher than if very little of this fertilizer had been applied or none at all, and 1.30 per cent higher than that obtained with a top-dressing of sulphate of ammonia. As a rule, oat straw with a 1.28 per cent higher albuminoid content is obtained from the use of a large quantity of an organic nitrogenous manure than by the application of any other fertilizer.

On the other hand, it is probable that organic nitrogenous fertilizers decrease the amount of levulose in oat straw, and that from the point of view of sugar production, sulphate of ammonia is superior to organic nitrogen. By ploughing up an old field of thick clover, or applying a liberal dressing of stable-manure, the albuminoid or meat-forming substances in straw can be increased until they are 1.5 times higher than in the case of straw grown on badly cultivated land, but the proportion is reversed as regards the sugar content.

The author has also studied the connection between the variations in the albuminoid content of the straw and geographical position, and states that the albuminoid substances increase the further north the oat-crop is cultivated. This may be explained to some extent by the fact that as the vegetative period is shorter, there is less time for the grain to abstract as large an amount of nutritive substances from the straw as in the south, but it is equally possible that the difference in rainfall may have some influence.

In order to have a high sugar content, it is necessary to have fine weather at harvest time. When it is dry, the straw loses little of its sugar, but in wet weather, the sugar content is greatly reduced.

The albuminoid and sugar percentages varied from 1.1 per cent—8 per cent, and from 0.3 per cent—9.7 per cent respectively, that is to say, good quality oat-straw may have a higher feeding value than poor hay.

686.—The Laws of Heredity and the Breeding of Farm Animals.—Hunt, W. D., *New Zealand Journal of Agriculture.* Vol. XXVII, No. 2, pp. 103-111. Wellington, 1923.

The author draws attention to the importance of the stock breeder possessing marked ability in the selection of animals, as well as a knowledge of the laws of heredity.

The following is a brief record of results obtained by J. Gibson the well-known Tasmanian breeder of Merino sheep which are grown almost entirely for wool, the desire being to produce a sheep that would give the greatest amount of the best quality of wool. In 1868, he bred the ram Sir Thomas the most noted Merino of his time; the heaviest fleece cut from this ram for twelve month's growth was 12 pounds. The descendants of Sir Thomas given in order gave fleeces of the following weights respectively:—14 pounds, 17 pounds, 18 pounds, 20 pounds, 26 pounds, 23 pounds, 27 pounds, 30 pounds, 36¾ pounds.

Thus, in a little over thirty years by selecting those variations showing increased weight of wool, the weight was increased from 12 pounds to 36¾ pounds, and this was done entirely within the flock without bringing in any outside blood.

The discoveries of Mendel serve to explain the reason for many results, as for example, the fact that red calves sometimes appear in pure herds of black Aberdeen-Angus cattle. Black and red are Mendelian characters and black is dominant and red recessive, hence the result of crossing a black animal with a red would be a black animal although such a calf would carry in its germ-cells the factor for red. From the above it will be seen that, before a red calf can appear in black herd, both sire and dam must carry the factor for red; further, that if one animal were introduced into a herd which although itself black, carried the factor for red, it would be possible in time for red animals to appear. The only way to make sure of keeping red out of a black herd is as follows:—

(*a*) Before introducing a new bull into a herd, test it with red or red-and-white cows. If the bull is a pure black, all the calves will be black; if it carries the factor for red about half the calves will be red.

(*b*) Note results from bulls bred in the herd when used in cross bred herds. If any calves are red the bull carries the red factor. If the sire of this bull has been proved pure the red factor must have come from his dam, and the dam should be removed from the herd.

(*c*) If a red calf is born in a pure black herd the sire and dam must both carry the red factor, and both should be removed from the herd.

Every breeder will be trying constantly to bring his flock or herd nearer to his ideal. In order to do this he can use sires of type and ancestry as near to his ideal as he can get them, or he can select with a view to correcting some weakness in his own animals—that is, if his animals have gone to an extreme in one direction he can try to correct this by using sires that go to an extreme in the other direction.

The author considers that the first method is the best, as although the second method may produce animals of satisfactory appearance, they will not breed true.

To breed true the animals must have uniform germ-cells all carrying the same inheritance-factors. With an outcross there is always the danger of introducing germ-cells carrying the factor for some fault that may prove afterwards very difficult to eliminate, but experience has shown that animals which have been closely inbred for some time, respond quickly to an outcross.

The above consideration brings up the question whether the best plan in a large stud is not to divide the stud into several families and to closely inbreed each within itself until weakness appears; then introduce a sire from one of the other inbred families, and continue the inbreeding until another outcross is required, when another family can be used.

Another important matter when establishing a stud is that of location. Animals can be altered by environment and changes should all be in the direction of strengthening the type for the class of country in which they will live, or to which they will have to adapt themselves if sold. The location should be one where the conditions are such that natural selection will eliminate any individual unable to thrive under the conditions of the sires bred in the stud, where they are likely to be placed when sold.

691.—Controlling the Rations of Dairy Cows.—LEROY, A., *Revue de Zootechnie*, **Year 2, No. 7, pp. 20-31. Paris, 1923.**

Good results have been obtained in the Department of Seine-et-Oise by the simultaneous control of the milk yield and the rations of dairy cows. The control service which was instituted and is directed by the Stock-Breeding Committee (Comité d'Elevage) of the district has been placed under the management of the Departmental Agricultural Office. The method adopted is extremely simple and consists in periodically weighing the cows and their dairy ration. If this weighing is properly carried out, the work should be done in the same day as the milk is controlled, and can be done quickly and without a special staff, as approximate accuracy is sufficient for practical purposes. Having obtained these data, the controller is able, with the help of the existing tables giving the equivalent and percentage of the nitrogenous substances present in the various foods, to calculate feeding value and protein content of the ration. Since, on the other hand, he knows the average weight of the cows and the average yield of milk per head, he is also in a position to calculate with the help of the ration table the feeding value and protein content of the ration that is theoretically necessary for dairy cows of the same weight and giving the same amount of milk. By this means it can be ascertained if the cows are being properly fed, or whether the food requirements of any animal necessitate a change in the ration.

The results obtained by this double control were then plotted on two graphic charts, three curves being drawn showing respectively the effect of the ration on milk production, on butter yield and live weight. An examination of these charts shows the measures to be taken in every case and especially as to how the diet should be changed.

According to the author, these three rules can be deduced from the charts:

(*a*) If the curves of milk yield, butter production and live weight fall abruptly and are parallel, the ration must be increased.

(*b*) If the curves of milk yield and butter production fall slowly while the curve of the live weight remains horizontal, the cows are properly fed and no change should be made in the ration.

(*c*) If the curves of the milk yield and butter production fall slowly, while the weight curve rises decidedly, the animals are receiving too much food and the ration must be slightly reduced. In the last case, the tendency to put on fat which has already showed itself, will hinder milk production. It is however necessary in interpreting the graphs, to take into account any abnormal falls in the curves, as these are due to acute, or chronic affections which are quite independent of the diet.

692.—The Optimum Quantity of Skim Milk for Calf-Feeding.— Woodward, T. E., *Journal of Dairy Science*, Vol. VI, No. 3, pp. 213-214, Baltimore, 1923.

Feeding experiments were conducted at Beltsville, Maryland (U.S.) with 4 groups of calves with 4 calves per group, balanced as nearly as possible with reference to breed and body weight at birth. Each calf received its mother's milk until it was 10 days old; the change to skim milk was made gradually during the following 5 days, and the feed was then an entirely skim milk ration. One group was given a daily ration at the rate of $\frac{1}{7}$ body weight, two others at the rate of $\frac{1}{6}$ and $\frac{1}{5}$ and the fourth group was given all the milk the calves would drink, twice a day. The experiment lasted 70 days. Records were kept as to gains in weight made by calves on various quantities of skim milk; at least 50 per cent larger gains were noted for those receiving milk *ad lib.* than for those fed at the rate of $\frac{1}{7}$ their body weight. To do this they drank about 80 per cent more skim milk, about $\frac{4}{5}$ more than the first group. As regards the two other groups, less satisfactory results were obtained as it has been concluded that calves which received milk *ad lib.* and at the rate of $\frac{1}{7}$ made gains more economically than groups $\frac{1}{6}$ and $\frac{1}{5}$. In addition, feeding in large quantities did not cause scouring

698.—Potatoes in Pig Feeding.—I. Muller and Richter, *Zeitschrift fur Schweinezucht*, Year II, Part 3, pp. 39-41. Neudamm, 1923.

II. Idem, *Ibidem*, No. 5. pp. 66-68.

I. *The use of large rations of Potatoes in Fattening Pigs.*—Owing to the heavy potato crop produced in Germany in 1922, and the high price of barley, the question arose as to whether it was not possible to entirely suppress the cereal ration, and yet supply fattening pigs with sufficient protein.

The authors carried out some experiments in which they used 9 pigs, 5 belonging to the native improved breed, and 4 Yorkshires. The average age of the animals was twelve months. During the summer, they had been turned out to graze, but had been given a small supplementary ration of concentrates. The pigs were fattened for 6 weeks from October 23, and received per head and per day: 200 gms. of fish meal + 200 gms. dry beer-yeast + boiled, mashed potatoes *ad lib.* The fish meal contained: crude protein 46.4 per cent, crude fat, 3.97 per cent, salt, 9.4 per cent. The dry yeast contained 49.6 per cent crude protein, the potatoes 12.2 per cent starch. As the mixture was very liquid, it was necessary, in order to prevent diarrhoea, to add 200 gms. chopped oat straw per head and per day. Initial weight 210 pounds. Food consumed per head per day, 31 to 40 pounds, average 35 pounds. Digestible protein ingested 9.3 ounces per head per day. The daily increase in live-weight was 25.6 ounces which was very satisfactory. In order to obtain 2.2 pounds increase in live-weight, 43 pounds potatoes + 1 pound fish meal and beer-yeast were required viz. 10 pounds of dry food.

It is thus quite possible and very economical to suppress all the barley-meal in the fattening ration of swine.

II. *Should fattening swine be given Potatoes?* Owing to the high price of fuel, it seemed worth while trying whether pigs could be fattened on raw potatoes The authors carried out some experiments on 36 pigs of the ordinary breed, having an initial weight of about 120 pounds and which had been fed hitherto entirely on raw food. After a preliminary week of recuperation, the animals were given for 5 weeks, beginning from February 20, the following basal ration per head and per day: 22.4 ounces barley-meal + 4.8 ounces fish meal + 4.8 ounces beer-yeast + 0.6 ounce washed lime. As a complementary ration they were fed *ad lib.* *Lot I*: steamed potatoes; *lot II*: a mixture of $\frac{3}{4}$ boiled potatoes + $\frac{1}{4}$ raw potatoes; *lot III*: mixture of $\frac{1}{4}$ boiled potatoes + $\frac{3}{4}$ raw potatoes; *lot IV*: raw potatoes. The pigs fed raw potatoes showed no signs of digestive disturbances; while in the others the slightly laxative action of the cooked potatoes was evident and had to be corrected by the addition of a little chopped oat straw. Hence, the solanin in the potatoes had no injurious effect. The cooked potatoes however, were somewhat better assimilated, as shown by the fact that the pigs receiving them increased daily in live-weight more than twice as much as the others while consuming less food per unit of live-weight, as shown by the following table:

EXPERIMENTS IN FEEDING PIGS ON RAW AND COOKED POTATOES

Lot	Average initial live weight	Average final weight	Average increase in live wt	Total potatoes eaten per day	Consumption per 1 lb increase in live weight	
					Basal ration	Potatoes
	lb	lb	lb	lb	lb	lb
I	121	173.1	1.5	1[illegible]	1.5	11.7
II	126.3	163.9	1.1	16.5	[illegible]0	15.4
III	123.4	155.1	0.9	15.8	2.1	1[illegible].6
IV	118.6	140.6	0.6	1[illegible].1	[illegible]	1[illegible].2

702 — Milk for Young Chicks —DELMAS I *La Vie Agricole et Rurale* Vol XXIII No 30 pp 66-69 Paris, 1923

With the object of ascertaining whether giving milk to young chicks would prevent the great losses that frequently occur in very young broods especially when they belong to the Mediterranean breeds the author made experiments with 42 Leghorn chickens (of the white and brown variety that had been hatched on the same day The chickens were divided into 2 lots each of 21 birds The first lot was given milk with the addition of one-third water and weighed 987 gms while the second had only water to drink and weighed 994 gms Both lots were otherwise fed exactly alike The chicks drank the milk-and water with avidity The experiment was continued for two months and the results obtained were indisputable in the first lot only two chickens died whereas the number of deaths in the second was 6

These results were confirmed by experiments conducted on vitamines and if Vitamines A (antirachitis) is deficient in the food ration of chicks it should be introduced into the average ration even if the ration contains sufficient vitamine B (antineuritic) from the liberal grain supply and also plenty of vitamines C (antiscorbutic) which can be obtained from green food

405 —Studies on Poultry Feeding

I SCHOFIELD, M A Feeding Milk to Poultry *The National Poultry Journal* Vol LXII Part 3, No 116, p 151 London 1922

II WOOD, D Feeding the heavy layer, How to supply the essentials to heavy Production *Ibidem,* No 117 p 164-165

III BOSSERT A The Rational Feeding of Poultry *Ibidem* No 126, pp 295-297, No 127, p 305, No 128, p 319

IV DOBBIN, R C H Some Lancashire Experiments Wet versus dry Mash *Ibidem,* No 131, p 363

V HEPBURN, J S , HOLDER R C and others Rations for feeding poultry in the Packing House, *United States Department of Agriculture Bulletin* No 1052, 24 p Washington, 1922

I FEEDING MILK TO POULTRY — The by-products of milk (skim milk whey butter or condensed milk or whey whether liquid or in powder) have proved most useful both in the feeding of chicks and of adult fowls Powdered milk must be dissolved before use in ten times its weight of water Its nutritive value if equal weights are taken is the same as that of meat meal

Skim-milk can be fed either fresh or sour It is a mistake to attribute the efficiency of skim milk or whey solely to the lactic acid they contain and to believe that lactic acid can be substituted for the above substances although a small dose of lactic acid is very good for chicks as it not only acts as a mild disinfectant of the digestive canal but is also a stimulant and an excellent remedy against coccidiosis and other diseases If however an excessive amount of lactic acid is given it does serious injury by destroying the mucous membranes further it is of no use in the feeding of adult fowls when a well balanced ration is given Hence it is best to reserve lactic acid for a medicine and to use for food purposes only the by-products of milk

Skim milk whey and a solution of powdered milk are put into the drinking-troughs The acid solution is made into a mash Milk powder can also be added to the mash in the proportion of 5 per cent to 10 per cent About 1 gallon of mash per day is enough for 100 fowls The whey or solution of powdered milk should be fed at the rate of at least ½ gallon a head for 100 head By-products of sweet and of acid milk ought not to be given at the same time but may be fed on alternate days

From the results of his experiments SCHOFIELD concludes that non-acid milk by-products suit young fowls better than acid ones which ought to be used as a condiment rather than as a food

II FEEDING THE HEAVY LAYER —WOOD has studied the application to the heavy layers of our modern knowledge respecting the effect of the mineral constituents and the vitamines in the different feeds As a result of his own experience he suggests the following ration equal parts of wheat and oats mash middlings + bran + gluten + fish-meal + chopped clover or lucerne

hay + dried yeast + soy bean meal + ground oats (4:4:4:2:2:1:1). Once in three weeks 2 per cent of salt should be added to the mash, and once a fortnight 1 per cent (by weight) of crude cod-liver oil may be introduced.

III. THE SCIENTIFIC FEEDING OF POULTRY.—A hen that is not laying should be fed, in order for the ration to be well balanced, for every 100 parts protein 452 parts of carbohydrates and 20 parts of fat. A hen laying 1—2—3—4—5—6—7 eggs weekly, ought to consume respectively, for every 100 parts of protein, 421—394—375—362—347—336—327 parts of carbohydrates and 26—30—33—36—39—41—43 parts of fat. In calculating the ration of a laying fowl, BOSSERT advises that the egg production should be estimated at 5—6 eggs per week, viz. the ratio should be 100 protein: 340 carbohydrates: 40 fats, or in the simplest terms, 10:34:4.

The following rations fulfill all these conditions per 10 head and per day:

(1) Middlings, 9 ounces + meat meal, 2½ ounces + wheat, 12 ounces + maize, 3½ ounces, + hemp seed 3½ ounces + bone-meal, ½ ounce + green food 1 pound 10 ounces.

(2) Middlings, 6½ ounces + fish-meal 3 ounces + wheat, 13 ounces + maize 3 ounces + hemp seed 5 ounces + bone-meal, ½ ounce + green food 1 pound 10 ounces.

The grain is given separately, but at the same time as other substances (which are mixed into a mash) both morning and evening; the green food is given mid-day.

IV. DRY VERSUS WET MASH.—This paper gives an account of various experiments described and discussed at a meeting of the Lancashire Utility Poultry Society. Most of the experiments had been carried out on the County Farm, at Hutton, and show that wet mashes should not be discontinued, but given alternately and supplemented by grain fed separately and by green food.

V. FATTENING RATIONS FOR POULTRY.—When, as is the case in the United States, poultry are sent long distances, they should not be fattened by the rearer, as the birds loose their flesh on the journey, and the sender cannot despatch them as frozen meat. Therefore, the poultry rearing industry has to be divided into two branches, the production and fattening branches respectively. Fattening takes 1 to 2 weeks and is carried out at the packing-houses.

Poultry-fattening as a specialized industry is making rapid progress in the United States; this induced the author to carry out his investigations in the Food Research Laboratory of the Department of Agriculture of the United States. He compared different rations and determined: (1) the increase in live-weight obtained; (2) the improvement in the edible portions of the fowl.

Two kinds of experiments were carried out; in the first various tests were made for each ration with 12 fowls fed and studied separately.

In the second class, the so-called Battery experiments a large number of fowls (up to over one thousand in a lot) were studied in flocks. The rations fed the control lot consisted of maize-flour and butter-milk (40 60). In the experiment rations part of the maize-flour and of the butter-milk was replaced by one or more of the following foods: barley maize-flour—whole oats—entire oat-meal—oat-meal patents—ground oats—rice bran—rice husks—ground rice—wheat offals—wheat middlings—coconut cake—ground decorticated ground-nut cake—undercorticated ground nut cake—colza cake—soy-bean cake—kafir—ground milo—lucerne—meat scraps—condensed whey—powdered whey. The fowls were weighed on the 1st., 4th., 11th. and 14th. days of the experiment.

One table gives the composition of the foods used the other 12 give the results of the experiments.

The averages of the most important results are to be found in the following table:—

Class of birds	No. of birds per class	Increase in 4 days		Increase in 8 days		Increase in 11 days		Increase in 14 days
		% of initial weight	% of total gain	% of initial weight	% of total gain	% of initial weight	% of total gain	% of total gain
Cockerels	612	12	30	23	57	31	78	40
Pullets	396	....	....	17	60	24	85	29
Adult cocks	336	11	50	17	77	21	93	22
Hens	456	4	34	8	65	10	84	12

The younger birds (cockerels and pullets) increased most rapidly in live weight when given a concentrated protein food such as cake, or meat scraps. The hens did not give uniform results, from which it would appear that meal suits them as well as a concentrated protein food.

The best length for the fattening period depends to a great extent upon circumstances. A fortnight is certainly not too long for cockerels, since they continue increasing in weight rapidly for this time; whereas pullets gain all their weight in 11 days. In the case of adult cocks and hens, the fattening period must be limited to 6-8 days.

The analyses made of different parts of the body of a large number of birds belonging to the various classes showed no difference produced by the rations on the edible portions, or the dressing losses, although the classes differ perceptibly in both these respects.

The yield of edible portions (in per cent of live weight) was for unfattened and fattened birds respectively: cockerels 56 and 60—pullets, 63 and 67—cocks, 62 and 64—hens, 70 and 71, which shows the advantage of fattening. In the last chapter is given the compositions of rations for fowls that are to be fattened.

704.—Effect on Egg Production of Artificial Lighting of Poultry Houses in Winter.—DENIS, G., *La Revue Avicole*, Year 33, No. 3, pp. 195-197. Paris, 1923.

During the winter 1921-22, the author used to shut up his hens in the fowl-house as soon as it became dark, but he turned on the light from 9.30 p.m. to 10 p.m. and supplied the birds with food and water. As the arrangement gave good results, he repeated the experiment during the following winter with one important modification. The fowls were shut up when it became dark, but the henhouse was lighted from the time of their return until 10 p.m. Very small grain, barley and oats, and especially millet were scattered on the ground amongst the straw and sawdust, and at 9 p.m., the birds were given a grain different from that fed them during the day. The fowls had a liberal and varied diet: black oats, buckweat, barley and oats, millet and mixture (maize, hempseed and sunflower seeds) as well as paste every day early in the morning and household scraps with the addition of a little fish-meal or meat or meat meal and powdered oyster shells at 11 o'clock. Ten days after this regime was started, the birds' combs became of a brighter red and they regained their lively gait. By November 1, a large number of the hens were already laying; on the 15th, almost all were producing eggs, and on the 20th, out of the 115 fowls belonging to the various breeds which included White and Buff Wyandottes, White and Buff Leghorns, Black La Bresse and Bourbonnais, there was not a single hen that was not laying.

The author estimates that without the use of artificial light only 20 to 25 of the hens would have been laying and their egg production would have been much more irregular. The increased egg supply obtained would thus appear to be due to the influence of the light, which, by shortening the hours of darkness not only allowed the fowls to lay until 10 o'clock at night but also made it possible for them to take in the store of food needed for the production of a large number of eggs.

FARM ENGINEERING

734.—Electro-Culture Work in Great Britain, 1922-1923.—I. *Fifth Interim Report of the Electro-Culture Committee, Ministry of Agriculture* London, 1923.—II. *Journal of the Ministry of Agriculture,* Vol. XXX., No. 4 pp. 321-326. London, 1923.

Experiments have been made by Prof. V. H. Blackman, with winter wheat and barley (Rothamsted Experiment Station), with cabbages, swedes, mangolds and potatoes (Harper Adams Agricultural College), and with potatoes at Lincluden. Laboratory investigations were conducted at the Imperial College of Science, London. Electrical measurements were made to determine the influence of an electro-culture installation on electrical conditions to leeward and windward. Pot culture experiments were made with barley to ascertain the stage at which the discharge can most advantageously be applied, the correct duration of the discharge and the result of normal atmospheric currents.

Results showed a very marked increase in grain yield as much as 118 per cent, but only a small increase in total yield. The effect was such that it established a differential action of the discharge—namely that of accelerating reproductive growth apart from vegetative growth—an effect hitherto unsuspected. Electrification for the first, second and third month respectively of the growing season gave in all cases an increase in yield, the second monthly period giving more than double that of plants not subjected to discharge. How far such an increase may be expected in other seasons remains yet to be determined. A current of lower intensity has been tried and if continued for the full period has been found equally effective, with the exception of the second month electrification system

73638—6

mentioned above. The removal of plants from the influence of the normal atmospheric current was accompanied by a slight reduction in yield.

Investigations have been in progress at Rothamsted to ascertain the best type of installation, the current required and the cost; the installation consists of 9 creosoted poles 24 feet in length of which 6 feet is sunk in the ground; the surporting wires are of rustless mild steel 125-130 yards long with twelve thinner wires of silicum bronze each 200 yards long; the porcelain rod insulators are 18 inches in length. The cost of installation and erection (materials, carriage, labour, travelling expenses and supervision) was £52 for 5 acres, *i.e.* about £10 per acre. It should not be taken for granted, however, that the cost of small installations can serve as a criterion of the cost in actual practice. The Agricultural Electric Discharge Company for example gives an estimate of £215 per 100 acres. The results from pot culture experiments are, however, important from the point of view of the installation required on an economic scale. It appears probable that lower level of wires would require a lower voltage. From the electrical measurements taken at Rothamsted on the wheat plot, on the stubble and on the field under installation, it has been concluded that with overhead wires whose distance apart is not much in excess of their height, fully half the current may be expected to reach the crop; also that a very considerable area surrounding the electro-culture area, specially on the leeward side, receives a discharge much in excess of that which passes normally between air and earth.

From the results obtained, there can be no question as to the economic application of electro-culture and the Electro-culture Committee consider that positive and economic conclusions will be reached by the end of 1925. It is proposed to concentrate attention solely on pot-culture, small plot experiments and laboratory investigations until that time when field experiments will be made, based on the scientific knowledge acquired in the preceding years.

AGRICULTURAL INDUSTRIES

782.—Cleaning Apparatus used in Machine Milking.—Burgwald, H. *U.S. Department of Agriculture, Farmers' Bulletin No. 1315*, pp. 15, figs. 13. Washington, D.C., 1923.

The Department of Agriculture of the United States has instituted a series of experiments in the sterilization of apparatus used in machine milking. Heat is the safest and simplest means of sterilization, the effect of which has chiefly been studied with reference to apparatus working in a vacuum, but the same principle could be applied with some small differences to other types.

The comparative bacterial counts made in the case of the apparatus sterilized with a solution of chloride of lime and with heat respectively have been favourable to the latter method. The average number of bacteria per cc. found in milk samples taken at 13 farms where other methods were employed was 257,900 whereas in the case of farms where sterilization by heat was practised, the average number of bacteria present was only 19,300 per cc. (the average age of the samples at the time the count was made was 12 hours).

The rubber portions of the apparatus were but little, if at all, more affected by the temperatures employed (71°C to 72°C) than when recourse was had to other methods of sterilization. The rubber must however be cleaned carefully before the heat is applied, for fatty substances exert an injurious effect at these temperatures.

The various operations of the process are explained by a series of diagrams. Immediately after milking, the apparatus is rinsed in hot water (which is in all cases sucked up by a vacuum system), 10 to 12 times in succession. It is then rinsed with water in which some cleansing substance has been dissolved, rinsed again, and subsequently immersed in water raised by steam to 160°-162°F. and kept at this temperature for 15-30 minutes. If no steam for heating is at disposal, it is best not to immerse the rubber portions until the heating is finished, in order to prevent their coming in contact with the wall of the heated receptacle. The vacuum tube ought to be cleaned every fortnight by the passage of hot water. The pails and covers should be sterilized with steam by preference, or else by means of immersion for 5 minutes in boiling water.

788.—Packing of Tomatoes for Market. —I. Parsons, F. E. Preparation of fresh tomatoes for Market.—*U.S. Department of Agriculture, Farmers' Bulletin No. 1291*, pp. 3-32. Washington, D.C.

II. Packing of Tomatoes for Export. *The Farmers' Weekly*, Vol. XXV, No. 650, p. 2323. Bloemfontein, 1923

There has been a serious lack of uniformity in the methods employed for packing fresh tomatoes for market and export. Parsons has inspected the important production centres in the United States and describes methods that have proved successful in commercial undertakings and others which have resulted in loss. As regards the suitability of certain packing

materials, the Chief of the Division of Horticulture, in South Africa, confirms the recommendations put forward in Germany and Holland with respect to the value of peat-mull. Ripe tomatoes packed in peat-mull retain their colour and hard skin as well as their juice and flavour. Evaporation is lessened and the weight of the fruit remains almost unchanged.

With the rise in temperature of the peat-mull, in the case of unripe fruits the ripening process is accelerated without causing shrinkage. In properly moistened, loosely spread out material, not only will the fruits be preserved but may even increase in weight and the colour and flavour is well developed. It takes from 5 to 7 times longer to evaporate the moisture in fruits if properly packed in dry peat-mull than would be the case if shelved and forwarded in the ordinary manner by insulated car. The antiseptic quality of peat-mull prevents bad fruits in a box contaminating the sound fruits.

481.—The Freezing Temperatures of Some Fruit, Vegetables and Cut Flowers.—WRIGHT, R. C. and TAYLOR, G. F. *United States Department of Agriculture, Bulletin No. 1133, pp. 1-8.* Washington, D.C., 1923.

Determinations of the freezing points of a number of fruits and vegetables have been made, by the Bureau of Plant Industry in compliance with the ever increasing demands of trade and shipping.

Determinations were made as follows:

(1) Apples: Average 28.48° F.

(2) Bananas (green), peel 29.84° pulp 30.22°; ripe peel 29.36°, pulp 20.6°; blackberries 29.15°; cherries 27.81°; cranberries 26.7°; currants 30.21°; gooseberries 28.91°; grapefruit 28.36°; grapes 28.16°; loganberries 29.51°; oranges 28.03°; peaches 29.4°; pears (hard-ripe) 28.46°; soft ripe 27.83°; persimmons 28.33°; plums 28.53°; raspberries 30.41°; strawberries 29.93° F.

Vegetables.—Average for beans (snap) 29.74°; cabbage 31.18°; carrots 29 57°; cauliflower 30.08°; egg plant 30.41°; Kohl rabi 30.02°; lettuce 31.2°; onions (dry) 30.09°; peas (green) 30.03°; potatoes 28.92°; sweet corn 28.95°; sweet potatoes 28.44°; turnips 30.23° F.

Cut Flowers.—Petals and leaves of lilies, peonies, and roses from 27° to 31° F.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Any one desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

The Periodicity of Meteorological Factors in Relation to Agriculture.—EREDIA, F., in *International Review of The Science and Practice of Agriculture,* Rome, July-September, 1923.

Phenology and Agriculture.—SCHARFETTER, R., in *International Review of the Science and Practice of Agriculture,* Rome, July-September, 1923.

The Status of the Movement to Establish Universal Standards for American Cotton.—BRAND, C. J., in *International Review of the Science and Practice of Agriculture,* Rome, July-September, 1923.

Ploughing Without Turning the Furrow, in Austria.—KALLBRUMMER, H., in *International Review of the Science and Practice of Agriculture,* Rome, July-September, 1923.

329.—The Wheat Climate in Italy.—AZZI, G., *Nuovi Annali del Ministero per l'Agricoltura,* Year II, No. 3, pp. 453-624. Rome, 1922.

334.—Microflora of the Polar Regions.—BARTHEL, C., Den II. *Thule Ekspedition til Gronland Nordkyser,* 1916-18, No. 1. Copenhagen, 1922.

340.—The Effect of Potassic Fertilizers upon the Development and Chemical Composition of Different Cultivated Plants.—E. GODLEWSKI, in *Comptes rendus des Séances de l'Académie d'Agriculture de France,* Vol. IX, No. 14, pp 404-412. Paris, 1923.

346.—The Mosquito-Destroying Power of Algae Belonging to the Genus Chara.—PARDO, L., in *Boletin de la Real Sociedad espanola de Historia natural,* Vol. XXIII, No. 3, pp. 154-157. Madrid, 1923.

354.—Morphological Characters Used in Flax Selection.—BLARINGHEM, L., in *Revue de Botanique appliquée et d'Agriculture Coloniale,* Year 3, No. 17, pp. 3-26. Paris, 1923.

73638—6½

357.—Physiological Studies on the Action of Formaldehyde on Wheat.—ATWOOD, W. M., in *The Botanical Gazette,* Vol. XXIV, No. 3, pp. 233-263. Bibliography of 58 works. Chicago, Ill., 1922.

358.—Modern Seed Testing: The New Zealand Official Seed Station.—FOY, N. R., in *The New Zealand Journal of Agriculture,* Vol. XXVI, No. 2, pp. 65-72. Wellington, 1923.

372.—The Distribution of Varieties of Wheat in France.—BRETIGNIERE, L., in *Revue de Botanique appliquée et d'Agriculture Coloniale,* Bulletin No. 16, pp. 785-792. Paris, 1922.

388.—Influence of Vine Training on Fruit Production.—AUCHTER, E. C., and BALLARD, W. R., Bulletin No. 250, *University of Maryland Agricultural Experiment Station,* pp. 207-234. Bibliography. College Park, Md., 1922.

404.—Studies in Swine-Feeding.—I. POULAIN, A., *Office régional agricole du Midi, Bulletin trimestriel,* No. 4, pp. 1-25. Marseilles, 1922. II. OTTO, *Deutsche landwirtschaftliche Tierzucht,* Year 26, No. 52, pp. 553-554. Hanover, 1922. III. WILLIAMS, D. W., and MCCONNELL, O. E., Rice Bran for Fattening Hogs. *Texas Agricultural Experiment Station,* Bulletin No. 286, 15 pages, College Station, Brazos County, Texas, 1922. IV. MULLER and RICHTER. *Zeitschrift fur Schweinezucht,* Year 29, Part 22, pp. 343-345. Neudamm, 1922. V. *Ibidem,* Year 30, Part 2, pp. 17-21, 1923.

410.—The Effect of Change of Temperature on the Basal Metabolism of Swine.—CAPSTIK, J. W. and WOOD, T. B., in *The Journal of Agricultural Science,* Vol. XII, Part 3, pp. 257-266, Cambridge, 1922.

412.—The Sugars and Albuminoids of Oat Straw.—COLLINS, S. H., and THOMAS. B., in *The Journal of Agricultural Science,* Vol. XII, Part 5, pp. 280-286. Cambridge, 1924.

437.—Restocking Streams.—DE LACHADENEDE, in *Revue des Eaux et Forêts:* Vol. LXI, No. 1, pp. 16-21. Paris, 1922.

438.—Purification and Utilization of Drainage Water by Means of Carp Breeding.—LECLERC, M. J., in *La vie agricole et rurale,* Year II. Vol. XXI, No. 38, pp. 215-216. Paris, 1922.

470.—Equipment Adopted in Sweden for the Field-Testing of Fertilizer Requirements.—VON FEILITZEN, H., in *Meddelande Nr. 228 fran Centralanstalten for forsokscasendet pa fordbruksomradet,* 32 pages, Stockholm, 1922.

479.—Studies on Hemp Retting.—ROSSI, G., in *Annali della R. Sculla Superiore d'Agricoltura in Portici,* Vol. XVII. Portici, Della Torre, 1922.

482.—The Use of Morphological Phenomena in Research on the Watering of Milk.—SPETELICI, L., in *Bulletin de la Société Scientifique d'hygiène alimentaire et d'Alimentation rationnelle de l'homme,* Vol. X, No. 10, pp. 632-638. Paris, 1922.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief summary of the contents of the more important articles in the October-December number of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

The Co-operative Purchase of Agricultural Requisites in Norway.—Seven pages. Gives an account of the origin and development of co-operative purchasing societies. The principal goods handled are fertilizers, feeding stuffs, seed, flour for domestic consumption, agricultural implements, fencing materials, electric apparatus, and oil for fuel. The central societies, called consortia, distribute the goods to the affiliated associations, including societies formed especially for the purpose, the agricultural societies and small holders associations, the dairies, cheese-making and co-operative productive societies.

The Problem of Increasing the Area of Land under Cultivation in Japan.—Thirty pages. A comprehensive article beginning with an account of the origin and development and present position of land ownership in Japan. The article then deals with the measures, legislative and other, taken to increase the area and productivity of the lands under cultivation, specialized and technical instruction, financial arrange-

ments, etc., and concludes with a statement of the results obtained.

The Share Renting of Farms in the United States.—Forty-three pages. An analysis of farm tenancy in the United States based on the census of 1920. The author deals with the subject under the following heads: where share renting is used in preference to cash; changes in the relative importance of share renting 1910 to 1920; principles underlying share contracts on farms; differences in share rental practice in widely separated parts of the United States; customary share rental practice used in raising some of the more important crops; the extent to which rented farms of different types are worked on shares; the size of share rented farms; some personal characteristics of share tenants, and the returns landlords realize from share rents.

More farm tenants pay share than cash rent in the United States. Of the farm tenants of known States three fourths (75.5 per cent) paid a share rent in 1919. Of all the farmers in the country 28 per cent were tenants who paid a share rent. In 40 of the 48 States and in 80 per cent of the counties of the country the share tenants on farms outnumbered the cash tenants.

The Teaching of Household Management in Italy.—Fourteen pages. Discusses the teaching of household management in women's training colleges and vocational schools, and gives an account of the various steps taken and resolutions passed in support of the spread of the teaching of household management.

Other articles in the October-December 1923 number of the "International Review of Agricultural Economics" are: The Russian Institute of Agricultural Co-operation at Prague; The Central Prussian Co-operative Bank; Recent Tendencies in the Organization of Agriculture in Germany; Agricultural Co-operation in Greece in 1921; Statistics of the Agricultural Consortia in Italy; The Progress of Co-operation in Palestine; Rural Co-operation in Roumania; The General Co-operative Bank of Russia; Municipal Hail Insurance in Alberta; Hail Insurance in Saskatchewan in 1922; The Constitution and Working of the Agricultural Mutual Insurance Societies in France; The Mutual Hail Insurance Society of the Spanish Farmers' Association; The Proposed State Agricultural Bank in Jamaica; The "Rabassa Morta" (an ancient form of agricultural agreement) in Catalonia; The Introduction of a Uniform Agricultural Tax in Russia.

THE CO-OPERATIVE SALE OF LIVE STOCK IN GERMANY

By A. BRENNING, General Secretary of the National Federation of German Agricultural Co-operative Societies

(Summarized from The International Review of Agricultural Economics)

While the beginnings of the modern agricultural co-operative movement in Germany are traceable to the middle of the last century, the co-operative sale of live stock only dates from its final decade. Such co-operation proved to be necessary as a consequence of the serious difficulties experienced in live stock dealing and in the distribution of meat.

In the regulations and instructions for the business of the societies in respect to the sale of live stock it is usually desirable to lay down the following principles:—

(*a*) A distinction between the classes of animals liable to compulsory delivery and others. Without a clear ruling on this point disputes with members are inevitable. Delivery is laid down as compulsory, for example, for pigs weighing more than 165 pounds, for calves of more than 90 pounds, or for all fat stock, such as pigs, sheep, calves, bullocks. It is essential to indicate specifically the animals exempt from compulsory delivery; *e.g.*, those under the prescribed weight, sick animals and those slaughtered for family use. Members, especially new members, may be exempted for a certain period from the obligation to deliver, *e.g.*, when they are bound by previous contracts. With these exceptions every breach of the obligation to deliver must be followed by the payment of a fine fixed at a fairly severe rate.

(*b*) The animal is handed over to the society at a fixed price or for sale on commission. In the first case account keeping is a simple matter, as the society buys on its own account. In the case of sale on commission, the animals are weighed and branded by means of stamps, clippings, earmarking, etc. The accounts are made up after the presentation of the salesman's charge, reckoning the expenses and apportioning them in respect of the different animals. Sale on commission has the great advantage of ensuring that the breeder receives the price obtained on the market while on the other hand the final payment tends to be delayed. The valuation of the animal is done by a committee formed for the purpose, thus preventing any possibility of discontent with the management of the society.

(*c*) The co-operative societies endeavour to protect themselves and their members against possible losses by means of insurance. This protection is however available only for members who have fulfilled their obligations, while any loss that may occur must be borne by those who, contrary to the provisions laid down in the rules may have delivered animals in an unsound condition, or animals which have been overfed.

(*d*) Sales to butchers and to private persons.

These societies are often accused of preventing or at any rate seriously interfering with the supply of fat stock to the locality. For this reason there is often a special clause in the rules, stating that all sales of stock to butchers or private persons in the towns and villages in the area of the co-operative society must be for slaughtering only and not for resale, and that the sale must only take place through the agency of the society.

The importance of the local societies for sale of live stock lies in their influence in regulating prices and in the stand they make against the manipulation of the trade The author is in a position to state from his own experience that after the formation of such a society in a district on the borders of Germany, from which all the fat stock were sent to Berlin, the prices paid to the farmers went up 25 to 30 per cent in consequence of the competition set up with the dealers.

If however the farmers believe that they should always obtain higher prices from the co-operative societies than from the dealers, they forget that these conditions will necessarily come to an end from the moment when the ordinary trade finds itself forced by the competition of the societies to pay the higher prices equivalent to the market prices. This stage will however be reached only when the co-operative society takes its place as a competing and controlling body.

The object of the co-operative sale of live stock is first and foremost to check dishonest trade and to eliminate the surperfluous middleman. But there are also wider aims, and among them the desire to secure to farmers a proper influence on the movement of prices, which was hitherto solely dominated by the trade. A single co-operative society can only achieve this end to a limited degree, though it can be compassed by means of joint action among the co-operative societies and the introduction of various regulations upon the markets.

But if the co-operative sale of live stock is to accomplish its object, the institution of local co-operative societies is not sufficient, because these will always be dependent on the salesman in the large cattle markets for the sale of fat stock and on the dealer for the sale of breeding stock.

They can only escape from this dependence by combined action and the formation of central co-operative societies which will be able to make their influence felt far more effectively on the markets, and especially by establishing agencies on the large central markets. There are in existence to-day, in addition to 407 local co-operative societies, 19 central associations, most of which stand for one region or province. Of the 407 individual co-operative societies, 286, *i.e.* 70.3 per cent belong to the National Federation of German Agricultural Co-operative Societies (*Reichsverband der deutschen landwirtschaftlichen Genossenschaften*). At the present time the co-operative sale of cattle has so far developed that the central co-operative societies, partly acting in conjunction with the Chambers of Agriculture, have selling agencies on all the large markets of Northern, Central, Western and Southern Germany.

Long experience shows that favourable selling conditions or a tendency on the market to a rapid rise in values, which allow the dealer to offer high prices, has an unfavourable effect on co-operative sales. The cause of this is the shortsightedness of some agriculturists who are still uninstructed in co-operative principles, and incapable of understanding the necessity of remaining faithful at such times to the co-operative sales organization, so that the influence gained may not be lost, as it cannot be regained without serious difficulties and exceptional efforts in the competition with the trade.

It is well known that co-operative live stock selling is in opposition to the ordinary trade. It is not thereby implied that the co-operative societies oppose or regard as superfluous every kind of activity of the trade in this field; they deprive the trade of a certain part of its sphere of action, and do so deliberately, since they were formed with that object. What was the state of affairs in the past? An army of agents poured over the country districts keeping the prices to be paid to the farmer as low as possible and selling dear to the consumer. There were too many middlemen between the producer and the consumer.

The co-operative societies aimed, so far as possible, at suppressing the unnecessary intermediary trade. It is not therefore surprising that the trade threw all possible hindrances in the way of co-operative live stock societies. At the time when these societies were first founded, the trade tried to crush them by offering higher prices. Probably all the co-operative societies had much the same experience and not a few

were seriously crippled, as the farmers were not yet thoroughly imbued with the co-operative spirit.

Even in the future the activity of the societies will have to be confined to the sale of the live animals. Before the war the question of the formation of co-operative societies for slaughtering and the sale of meat was eagerly discussed by farmers. Denmark furnished the model, where from the end of last century co-operative bacon factories had been developed on a large scale. In Germany, however, conditions are essentially different, and experience shows that they are unfavourable to the establishment of such societies.

The general working of a co-operative slaughterhouse is too complicated; it requires the attention of a large staff and of an expert manager, enjoying the full confidence of the members, and there are also special difficulties in building up and keeping a circle of customers.

Collaboration is however possible between the co-operative societies of producers and of customers, that is between the agricultural co-operative societies and the distributive co-operative societies. In the *Konsumgenossenschaftliche Rundschau,* the organ of the Federation of German Distributive Co-operative Societies *(Zentralverband deutcher Konsumvereine),* of Hamburg, it was reported in 1920 that in Bavaria these societies had begun to buy and slaughter animals and to sell the dressed meat in the shops belonging to the Federation. Further developments have followed these lines. If the animals are purchased from the co-operative live stock societies, the most direct route from producer to consumer will be established. Both parties will attain a long desired end, and it will be possible to avoid that exaggeration in the application of co-operative methods, whereby the farmers, on the one hand, are urged to engage in the business of preparing their produce for the consumer in the form of bread, meat or sausages, and, on the other, the distributive societies are urged to take up agricultural production. On this point it is worth recalling what was said by Kaufmann, a member of the executive committee of the Central Federation of the German Distributive Co-operative Societies, on the occasion of the Congress of the Societies belonging to the Federation, held at Baden-Baden in 1921. Kaufmann remarked that there are limits even to the action of the distributive societies and that it is unnecessary to invade the sphere of agricultural production, as it is impracticable that the distributive societies should grow on their own farms the produce that the members require. He also observed that agriculture is peculiarly capable of adaptation to any form of economic organization and that it is particularly suited to a system of supplying to order, when agreements to furnish goods are established as between distributive co-operative societies and agricultural co-operative societies or individual farmers.

Reference may be made to one further point. The work of the co-operative societies demands a staff with high professional and technical qualifications, and also good business capacity. This holds good for all societies, but particularly for co-operative production and sale and for the sale of draught animals. The staff question is fundamental. It is essential that in this respect the societies should not fall behind the trade, if they do not wish to court defeat. It is true that it is not sufficient that the staff should have a purely business experience. The officers and the committee of supervision should bring to bear co-operative influence as strongly as possible and maintain it in full vigour. Otherwise it is to be feared that co-operative selling will become a mere counterpart of the trade, and that the co-operative societies themselves will lose their economic and social character, which makes them so valuable in the national interest. This danger must be avoided at all costs.

The difficult economic conditions of the present time demand the extinction of all unnecessary middlemen. This does not involve unreasonable claims on the part of the societies, nor any failure to recognize the right of honest trade to exist. There is adequate scope for the activities of both and the ruinous monopoly of either is the thing to be avoided. As in all co-operative work, so too as regards the sale of live stock, the object cannot be fulfilled unless individual farmers understand the necessity for maintaining in their own interest and by means of active personal support, the institutions set up by their own vocational organization. To achieve the aim desired, a continuous and active propaganda is essential. This however will undoubtedly be successful, since in effect co-operation is a question of good discipline and order.

CONGRESSES AND CONFERENCES

FOURTH INTERNATIONAL PEDOLOGICAL CONFERENCE, MAY, 1924, at the International Institute of Agriculture, Rome. The International Pedological Committee decided at the meeting held in Zurich in June 1923 that this Conference should cover a period of 8 days. It is proposed that an International Pedological Association should be established. Excursions will be arranged in the district of Rome and characteristic parts of Italy during and at the close of the Conference. Communications should be addressed to the Comité organisateur italien de la IVe Conférence Internationale de Pédologie, Institut International d'Agriculture, Villa Umberto I. Rome (Italy).

INTERNATIONAL SEED CONFERENCE IN LONDON, JULY, 1924.—The information and decisions arrived at, at the International Seed Conference held at Copenhagen in 1921 are published in book form obtainable from Dr. Volkart, Zurich (Switzerland). Price 5 francs Swiss. A European Seed Association was subsequently established. On the invitation of the British representatives, the next Conference will be held in London and Cambridge.

INTERNATIONAL CONGRESS AND EXHIBITION OF SOCIAL ECONOMY AT BUENOS AIRES (ARGENTINE REPUBLIC) SEPTEMBER, 1924.—This Congress and Exhibition will be held at Buenos Aires under the auspices of the "Museo Social Argentino", an unofficial institution in co-operation with the Argentine Government. The Congress will deal, *inter alia*, with agricultural questions, comparison of the importance of agriculture and commerce and industry in various countries, organization of agricultural credit and of international commerce in agricultural produce, etc.—Besides delegates representing national or municipal authorities any one interested can on payment of a fee, attend the Congress. Inquiries should be addressed to Museo Social Argentino, Maipu 126, Buenos Aires, Argentine Republic.

IMPERIAL BOTANICAL CONFERENCE, LONDON, JULY 7, 1924.—At a representative meeting of botanists held at the Linnean Society's rooms it was decided to hold a Conference of British and Overseas botanists early next summer on the occasion of the British Empire Exhibition. It is expected that the Conference will include discussions upon modern aspects of systematic botany, ecology, morphology, plant-physiology, genetics, plant pathology, and upon the best means of effecting interchanges of students and staff between various parts of the Empire. The meetings will all be held within the week and excursions will be arranged for the week end and the beginning of the following week. (*The New Phytologist*, Vol. XXII, No. 3, London, 1923).

WORLD POWER CONFERENCE IN LONDON, JULY, 1924.—In connection with the World Empire Exhibition and organized by the British Electrical Association. It is hoped that a large number of technical and scientific institutions and industrial organizations in Great Britain and other countries will take part. The aim of this Conference will be to study the most advantageous methods of utilizing machine power to meet national and international requirements. From the agricultural standpoint, comparison will be made between the experiments carried out with a view to improvement in scientific agriculture, irrigation and transport.

INTERNATIONAL EXHIBITION OF MILKING MACHINES AND REFRIGERATORS AT BUENOS AIRES, (ARGENTINA), MAY 5, 1924. Under the Direction of the Ministry of Agriculture. The exhibition will be divided into 4 sections: (1) Machines and implements connected with dairy farming and treatment of milk; (2) fodder for the milch cow and methods of preparation and preservation; (3) equipment for cold storage and technical methods employed; (4) literature, pamphlets, plans and publications in general. All exhibits will be accepted free of charge.

Communications should be addressed to the " Comité de la Exposicion International de Maquinaria de Lecherfa y Refrigeracion, Ministerio de Agricultura, Paseo Colon, 974, Buenos Aires.

FIRST INTERNATIONAL EXHIBITION OF DAIRY INDUSTRY AND COMMERCE AT MILAN, APRIL 1-7, 1924.—Under the auspices of the Italian Government. Amongst those invited to participate are included small producers who can exhibit only a minimum portion of their produce.

Communications should be addressed to "Comitato della Mostra del l'Industria e del Commercio caseario, Milano ".

BRITISH EMPIRE EXHIBITION: AGRICULTURAL SECTION, APRIL-OCT., 1924.—The Ministry of Agriculture and Fisheries is co-operating with the National Farmers' Union and the National Milk Publicity Council to put before visitors to the British Empire Exhibition at Wembley Park, London (April-October, 1924) a display that will convey an adequate picture of the history, progress and possibilities of land

cultivation in Great Britain and Ireland. There will be 240 feet range of show cases containing experimental subjects and samples of home products. Many phases of agricultural activity will be shown on the cinematograph, and some of the country's leading authorities on scientific agriculture will be present to explain the pictures and give lectures.

A completely equipped exhibition of dairy farming will be arranged by the Farmers' Union and Publicity Council. A dairy (100 feet by 70 feet) and a cow shed (30 feet by 70 feet) will be erected; 40 cows of the finest breeds will be housed in the shed and demonstrations made as to the most modern methods of milking and the dairy by-products.

AGRICULTURAL STATISTICS

AREAS SOWN WITH WINTER WHEAT AND RYE

Countries	Wheat			Rye		
	1923-24	1922-23	Average 1917-18 to 1921-22	1923-24	1922-23	Average 1917-18 to 1921-22
	Acres	Acres	Acres	Acres	Acres	Acres
Belgium	343,000	333,000	308,000	563,000	558,000	534,000
Bulgaria	1,989,000	2,260,000	2,043,000	....	....	....
Spain	10,158,000	10,175,000	10,130,000	....	....	....
Finland	....	....	....	583,000	580,000	580,000
Latvia	74,000	72,000	58,000	657,000	650,000	576,000
Lithuania	179,000	173,000	87,000	1,415,000	1,430,000	1,237,000
Poland	2,572,000	2,362,000	....	....	....	....
Roumania	5,365,000	5,600,000	4,820,000	484,000	593,000	600,000
Czechoslovakia	1,362,000	1,310,000	1,402,000	2,111,000	2,070,000	2,150,000
Canada	767,000	878,000	703,000	....	....	....
United States	40,191,000	46,090,000	45,310,000	4,377,000	5,506,000	5,990,000
Algeria	2,300,000	1,917,000	....	....	....	....
Tunis	1,161,000	1,150,000	....	....	....	....

FOREIGN CROP CONDITIONS

(February 20, 1924)

In numerous European countries the sowings were hindered, in the north by excessive rains, in the south by dry weather. While the actual data are yet far from complete, there is reason to believe that the aggregate extent of European cereal sowings differs but little from that of last year. Germination is backward in some countries, but is in the main regular.

Great Britain.—Persistent rains in December and January kept farm work behind throughout the country. Drier weather was experienced in the last week of January. The area under wheat is stated to be about 10 per cent less than last year.

France.—The winter wheat crops are of favourable appearance, although late sown plants are occasionally weak and thin as a result of excessive moisture. It is generally expected that the winter wheat acreage will be slightly above that of last year although considerably smaller than the pre-war average. Preparations for spring sowing are continuing actively.

Belgium.—Autumn sown crops have come through the adverse weather with little damage reported. Germination has been even and rapid.

Sweden.—Owing to a wet autumn and early winter it is estimated that the winter wheat area is 14 per cent less than that of last year and that of winter rye 21 per cent less.

Germany.—Mild weather prevailed in the last part of January. The crop outlook was satisfactory.

Russia.—Winter sowings in the southeast have been greatly extended this season, the estimated area under all grain being 13,-

500,000 acres, an increase of 31 per cent over last year. Latest reports comment favourably on the agricultural situation.

Italy.—The general crop outlook is described as satisfactory. The appearance of plants is promising in the south and of late has improved in the north.

The Balkan States.—The crops entered the winter in good condition and are protected by a thick covering of snow. The winter wheat acreage of Roumania is 4 per cent less than last year and that of Bulgaria 12 per cent less. The acreage of Jugoslavia and Hungary is reported to be about 10 per cent greater than last year.

North Africa.—In Algeria moisture conditions are good, and the crop conditions satisfactory. Good rains have fallen in Tunis and Morocco where drought was previously causing apprehension.

India.—The prospects of the wheat crop are favourable. The first estimate of the area under wheat is 30,203,000 acres which is an increase of 2 per cent over last year.

Argentina.—Harvesting of wheat is completed, favoured by excellent weather. Large crops of wheat and oats are confirmed, and there are prospects of a large corn crop.

Australia.—Fine crops of wheat were obtained in west and south Australia. The total crop of the country is now estimated as 125,830,000 bushels compared with 107,000,000 last year.

IMPORTS OF WHEAT BY COUNTRIES OUTSIDE OF EUROPE

(From Broomhall's Corn Trade News, January 15).

In addition to the disadvantage of unfavourable exchange movements, this country and Europe generally have found unexpected difficulty in supplying the requirements of bread grain, by reason of the continued heavy takings of the Orient. Shipments to ex-Europe reported this week are again over 4,000,000 bushels, whilst shipments to the United Kingdom direct are but 2,792,000 bushels, and the total for United Kingdom and orders 4,952,000 bushels—we might get all the orders, but the chances are that not more than half of them will discharge at our ports. A full normal weekly shipment for ex-Europe is some 1,760,000 bushels, and it goes without saying that if shipments to ex-Europe had averaged no more than this since August 1st, the additional quantities which would have been available to United Kingdom and Continent would have made a vast change in the supply position on this side of the world. The shipments to Japan are expected to continue until the import duty is re-imposed on April 1st, after which they may be light; but there may be no let-up of Chinese buying, whilst Manchuria talks of importing a million sacks of flour from America. If a part of the Chinese people are at last substituting wheaten bread for rice, millet, etc., it is difficult to guess how much wheat (or flour) will be taken in the season—it will be a big quantity.

THE BARLEY, OATS, CORN, FLAX AND SUGARBEET CROPS OF 1923

Tables giving the acreage, production and yield per acre of wheat and rye in 1923 compared with 1922 and the average of the five years 1917-21 were published in the *Agricultural Gazette* for January-February, at page 105. In the following tables similar data are presented for barley, oats, corn, flax and sugarbeets.

Barley.—The total production in 1923 for the countries for which figures are available is 1,163,348,000 bushels, an increase of almost 140,000,000 bushels over last year and of 160,000,000 bushels over the five year average. There was a total increase in Europe of 72,000,000 bushels made up mostly by increases of 35,000,000 bushels in Germany, 34,000,000 in Spain and 17,000,000 in Poland. There was a decrease of 35,000,000 in Roumania, but practically all the other countries of Europe show increases. Canada, United States, Algeria, Tunis and Argentina are the countries outside of Europe showing the largest increases.

Oats.—The total increase over last year is 467,000,000 bushels and 517,000,000 over the five year average. Of this increase over last year 298,000,000 bushels were in Europe, the greatest gains being in Germany, France and Poland. The only countries showing decreases were Esthonia, Finland, Lithuania, Norway, Roumania and Sweden. Outside of Europe there were increases in Canada, the United States, Algeria and Argentina.

Corn.—The totals have not been compiled for this cereal as for some of the countries mentioned estimates have not been received for all the years in question. The United States crop, which composes a large part of the world's total is 148,000,000 bushels greater than that of last year and 216,000,000 greater than the five year average. There are increases in most of the European countries. There is no estimate yet of the large Argentine crop now being harvested.

Flax.—There is a large increase in the production of flax seed in Argentina. India and the United States and Canada, the other big producers, also show increases. The production of flax fibre, with many countries yet to hear from, is about the same as last year.

Sugarbeets.—The total production is about the same as last year, but is nearly 8,000,000 tons greater than the five year average. There are decreases from last year in Germany and a few other European countries, and estimated increases in Italy, Sweden and the United States.

BARLEY

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Thous. bush	Thous. bush.	Thous. bush.	Bushels	Bushels	Bushels
Germany	3,214	2,847	2,831	108,447	73,838	82,209	33·7	25·9	29·0
Austria	333	313	246	7,501	5,599	4,576	22·5	17 0	18·6
Belgium	93	80	88	4,223	3,438	4,306	45·4	43 0	48·9
Bulgaria	531	534	539	12,282	11,941	8,970	23·1	22·4	16·6
Denmark	689	667	597	33,998	30,433	23,225	49 3	45 6	38 9
Spain	4,540	4,082	4,225	111,862	77,534	86,010	24 6	19 0	20·3
Esthonia	331	331	269	4,831	6,670	4,415	14 6	20·2	16·4
Jugoslavia	488	941	918	14,327	11,070	13,289	29 4	11·8	14 5
Finland	277	297	284	3,789	4,557	5,117	13·7	15 3	18·0
France	1,745	1,713	1,607	46,994	40,909	34,329	26·9	23·9	21·4
England and Wales	1,327	1,364	1,509	44,753	44,620	47,889	33 7	32·7	31·7
Northern Ireland	2	3	3	94	96	111	47·0	32·0	37·0
Hungary	1,176	1,145	1,225	24,649	22,170	21,540	21·0	18·4	17·6
Italy	568	576	530	10,477	8,254	9,022	18·4	14 3	17·0
Latvia	437	391	361	6,966	6,770	6,496	15·9	17 3	18·0
Lithuania	432	417	395	8,359	10,725	6,097	19 3	25·7	15·4
Luxemburg	5	9	6	138	177	111	27·6	19·7	18·5
Norway	132	132	148	3,800	4,483	4,916	28·8	34·0	33·2
Netherlands	59	61	57	2,922	3,196	2,683	51·1	52·4	47·1
Poland	2,964	2,824	2,610	76,037	59,559	58,151	25·7	21 1	22·3
Roumania	4,641	4,269	3,669	58,480	93,780	56,430	12·6	21·0	15·4
Sweden	410	427	421	11,712	13,830	11,828	28·6	32·4	27·1
Switzerland	16	16	19	570	482	631	35 6	30·1	33·2
Czechoslovakia	1,697	1,668	1,662	55,177	46,352	42,355	32·5	27·8	25·5
Total Europe	26,107	25,107	24,219	652,388	580,483	534,706	24·9	23·1	22·1
Canada	2,785	2,600	2,708	76,998	71,865	62,351	27·8	27·8	23·0
United States	7,905	7,317	8,032	198,185	182,068	186,854	25·1	24·9	22·5
Lebanon	64	64	......	1,194	730	...	18·7	11·4	.....
Japan	2,515	2,746	2,912	88,813	87,138	92,073	34·3	31·7	31·6
Korea	......	......	......	30,721	32,889	33,897	....	.....	......
Palestine	......	......	......	1,026	1,475	2,034	....	.....	......
Algeria	2,827	2,868	2,717	45,149	19,805	34,886	16·0	6·9	12·8
Egypt	400	375	385	11,989	11,306	11,189	30·0	30·1	29·1
Morocco	2,866	2,548	2,246	32,736	27,230	32,805	11 4	10·7	12·4
Tunis	1,206	503	1,173	11,482	1,837	8,102	9·5	3·0	5·9
Argentina	638	600	625	12,667	7,656	3,282	19·9	12·8	5·3
Grand Total	47,313	44,828	45,017	1,163,348	1,024,482	1,002,179	24·6	22·1	21·5

OATS

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Thous. bush.	Thous. bush.	Thous. bush.	Bushels	Bushels	Bushels
Germany	8,262	7,912	7,670	395,976	260,373	307,725	47·9	31·9	40·1
Austria	801	704	633	24,358	17,239	15,244	30·4	24·5	24·1
Belgium	652	717	583	34,217	33,679	30,259	52·5	47·0	50·9
Bulgaria	344	352	338	9,461	8,606	6,429	27·5	24·4	19·0
Denmark	1,119	1,119	1,023	64,842	54,969	43,249	57·9	49·1	42·3
Spain	1,595	1,514	1,533	38,044	29,378	31,970	23·9	18·4	20·9
Esthonia	399	399	346	9,224	9,466	7,706	23·1	23 7	22·3
Jugoslavia	1,000	983	1,016	18,215	17,197	19,364	18·2	17·5	19·1
Finland	1,038	988	1,038	20,036	26,540	24,932	19·3	26·9	24·0
France	8,545	8,492	7,999	355,272	271,311	224,531	41·6	31·9	28·1
England and Wales	1,976	2,157	2,405	87,097	82,485	105,347	44·1	38·2	43·8
Northern Ireland	390	400	423	20,109	20,199	21,601	51·5	50·5	51·1
Hungary	856	811	844	24,144	21,227	20,834	28·2	25·2	24·7
Italy	1,223	1,214	1,184	37,485	28,673	33,701	30·6	23·6	28·5
Latvia	764	681	622	19,311	17,102	15,852	25·3	25·1	25·5
Lithuania	816	769	7 04	20,347	27,240	14,962	24·9	35·4	21·3
Luxemburg	64	71	61	2,723	1,437	1,494	42·5	20·2	24·5
Norway	301	301	325	9,413	12,593	14,444	31·3	41·8	44·4
Netherlands	379	394	389	22,534	18,728	20,141	59 5	47·5	51·8
Poland	6,215	5,879	5,050	228,400	162,469	147,025	36·7	27·6	28·1
Roumania	3,324	3,295	2,725	61,805	86,658	63,392	18·6	26·3	23·3
Sweden	1,801	1,799	1,802	62,832	74,310	63,641	34·9	41·3	35·3
Switzerland	51	51	54	2,879	2,321	3,448	56·5	45 5	63 9
Czechoslovakia	2,081	2,017	1,967	81,193	67,344	62,938	39·0	33·4	32·0
Total Europe	43,996	43,019	40,734	1,649,917	1,351,544	1,300,229	37·5	31·4	31·9
Canada	13,727	14,541	15,171	537,733	491,239	436,130	39·3	33·8	28·8
United States	40,800	40,790	42,776	1,299,823	1,215,803	1,272,736	31·8	29 8	29·8
Algeria	596	583	586	15,011	5,243	12,818	25·2	9·0	21·9
Morocco	33	28	21	1,084	169	368	32·8	6·0	17·5
Tunis	121	112	152	2,594	746	3,197	21·4	6·7	21·0
Argentina	2,747	2,618	2,529	77,211	51,742	40,424	28·1	19 8	16·0
Grand total	102,020	101,691	101,969	3,583,373	3,116,486	3,065,902	35·1	30·0	30·1

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous acres	Thous. acres	Thous. acres	Thous. bush.	Thous. bush.	Thous. bush.	Bushels	Bushels	Bushels
Austria	145	148	106	3,710	3,461	2,255	25·6	23·4	21·3
Bulgaria	1,199	1,313	1,414	22,007	15,479	18,616	18·3	11·8	13·2
Spain	1,169	1,159	1,174	23,925	26,832	26,331	20·5	23·2	22·4
France	760	790	796	11,857	12,676	11,924	15·6	16·0	15·0
Hungary	2,466	2,445	2,092	55,158	48,725	40,933	22·4	19·9	19·6
Italy	3,707	3,811	3,821	84,248	76,796	87,336	22·7	20·2	22·9
Poland	189	183	132	....	2,776	2,266	....	14·7	17·2
Roumania	8,397	8,411	8,327	174,110	116,050	146,484	20·7	13·8	17·8
Switzerland	4	4	6	165	185	284	41·2	46·2	47·3
Czechoslovakia	397	392	377	10,455	9,884	9,540	26·3	25·2	25·3
Jugoslavia	....	4,722	4,566	88,579	89,797	87,463	....	19·0	19·2
Canada	318	318	268	13,608	13,798	13,629	42·8	43·3	51·0
United States	104,158	102,946	102,882	3,054,395	2,906,020	2,838,160	29·3	28·3	27·6
Guatemala	457	455	561	7,874	5,412	6,274	17·2	11·8	11·2
Philippines	1,378	1,359	1,166	16,663	14,651	14,451	12·1	10·8	12·4
Algeria	22	19	19	169	276	268	7·7	14·5	14·1
Tunis	45	....	42	284	....	276	6·3	.....	6·6
Java and Madura	4,030	3,887	4,182	50,116	47,501	53,424	12·4	12·2	12·8

FLAX

Countries	Area			Production of Flaxseed			Production of Fibre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Thous. bush.	Thous. bush.	Thous. bush.	Centals (100 lb.)	Centals	Centals
Belgium	45	41	72	396	356	555	403,700	334,800	735,800
Bulgaria	1	2	1	11	15	5	5,500	6,500	2,600
Spain	4	4	4	51	51	45	11,700	14,200	22,200
Esthonia	59	59	45	304	328	266	198,000	207,500	145,900
Finland	11	14	14	....	....	....	....	....	....
France	35	38	61	....	223	473	....	207,700	385,600
Northern Ireland	45	29	77	....	....	....	149,900	105,300	217,600
Hungary	5	7	10	....	41	71	....	51,900	74,200
Italy	70	52	48	390	413	426	52,700	49,800	58,400
Latvia	140	93	84	982	563	625	541,800	375,600	306,800
Lithuania	129	127	139	964	1,108	916	442,200	451,900	454,200
Netherlands	24	24	30	....	242	322	135,200	96,900	150,500
Poland	256	252	205	2,338	1,995	1,439	....	1,137,700	1,021,300
Roumania	31	27	30	....	194	151	....	31,100	21,400
Czechoslovakia	53	56	56	427	312	307	300,800	277,300	287,600
Canada	630	566	1,008	7,140	5,009	5,914	....	....	....
United States	2,061	1,113	1,652	17,429	10,375	9,718	....	....	....
India	3,358	3,011	2,957	21,280	17,440	15,800	....	....	....
Algeria	1	1	1	10	6	10	....	....	....
Tunis	7	4	7	47	4	50	....	....	....
Argentina	5,255	4,194	3,936	63,241	47,576	39,262	....	....	....

SUGAR BEETS

Countries	Area			Production			Yield per acre		
	1923	1922	Average 1917-21	1923	1922	Average 1917-21	1923	1922	Average 1917-21
	Thous. acres	Thous. acres	Thous. acres	Tons	Tons	Tons	Tons	Tons	Tons
Germany	948	1,031	836	9,585,425	11,895,785	7,978,340	10·1	11·5	9·5
Austria	32	28	17	237,270	190,510	110,020	7·4	6·8	6·5
Belgium	179	149	127	1,993,535	1,863,860	1,468,335	11·1	12·5	11·6
Bulgaria	31	24	26	168,655	235,680	109,890	5·4	9·8	4·2
Denmark	78	60	90	903,900	630,975	1,005,280	11·5	10·5	11·2
Spain	153	138	151	1,344,825	1,624,355	1,430,550	8·8	11·8	9·5
Jugoslavia	49	48	40	330,695	344,680	216,655	6·7	7·2	5·4
Finland	3	3	2	5,510	12,675	11,315	1·8	5·1	5·7
France	365	323	248	3,552,160	3,625,935	2,132,430	9·7	11·2	8·6
Hungary	135	104	90	971,745	783,905	651,895	7·2	7·5	7·2
Italy	210	203	125	3,031,365	2,486,490	1,468,065	14·4	12·2	11·7
Netherlands	166	138	137	1,889,105	2,003,980	1,942,485	11·4	14·5	14·2
Poland	337	270	197	2,838,045	2,944,750	1,244,285	7·4	10·9	6·3
Sweden	106	41	94	1,096,805	503,195	1,126,535	10·3	12·3	12·0
Switzerland	3	3	2	35,275	37,480	23,125	11·8	12·5	15·4
Czechoslovakia	574	519	531	5,686,995	5,776,295	4,878,950	9·9	11·1	9·2
Canada	22	21	24	216,200	190,400	243,600	9·6	9·2	10·0
United States	651	530	717	6,893,000	5,183,000	6,849,740	10·6	9·8	9·6
	4,042	3,633	3,454	40,780,910	40,333,950	32,891.495	10·1	11·1	9·5

THE WORLD'S LIVE STOCK

The following tables give, as far as official statistics are available, the numbers of horses, cattle, sheep and swine in the different countries in 1913 and in each year from 1919 to 1923. The figures for 1913 for some of the countries of Europe are not strictly comparable with those of the later years on account of territorial changes, but as a whole the tables show pretty clearly the fluctuations in the numbers of live stock during the last ten years.

The data in these tables have been taken from the International Yearbook of Agricultural Statistics and other publications of the International Institute of Agriculture which has collected all the official statistics issued by the different countries.

HORSES

Thousands

Countries	1913	1919	1920	1921	1922	1923
Europe—						
Germany (a)	4,523	3,465	3,588	3,666	3,648	...
Austria (a)	(b) 1,802	243	253	...	...	...
Belgium	267	162	205	222	230	...
Bulgaria (a)	(b) 478	...	412	...	...	...
Denmark	535	558	602	598	576	562
Spain	541	594	...	722	594	...
Esthonia	...	165	165	...	199	...
Jugoslavia (a)	(c) 153	...	1,127	1,059	1,043	...
Finland (a)	(b) 366	...	385	393	...	...
France	3,222	2,503	2,635	2,706	2,778	...
Great Britain	1,324	1,338	1,312	1,340	1,308	1,253
Greece (a)	(d) 149	...	201	...	...	...
Hungary (a)	(d) 2,352	...	635	...	...	...
Italy	(e) 956	990	...	...	...	...
Latvia	...	...	261	283	303	338
Lithuania	...	...	380	440	...	...
Norway	(b) 168	221	215	...	...	...
Netherlands	334	362	...	384	...	...
Poland	...	...	...	3,201	...	...
Roumania (a)	(d) 825	1,380	1,485	1,687	1,802	...
Russia-in-Europe (a)	24,504	...	16,966	17,109	...	...
Sweden	599	716	728	...	...	...
Switzerland	(d) 144	124	130	134	...	...
Czechoslovakia (a)	...	...	592	...	...	...
North America—						
Canada	2,866	3,667	3,400	3,814	3,649	3,531
Cuba	625	779	...	859	...	...
United States	20,567	21,482	19,766	19,208	19,056	18,853
Mexico	...	...	929	...	...	...
South America—						
Argentina	8,324	9,293	9,367	9,432	...	...
Brazil	7,290	...	5,254	...	...	...
Paraguay	478	490	...	...	...	...
Uruguay	556	555	...	...	...	...
Asia—						
India	1,555	1,688	1,718	1,697	1,684	...
Japan	1,582	1,480	1,468	1,511	...	...
Philippines	179	255	269	...	...	...
Russia-in-Asia	9,359	...	7,431	6,792	...	...
Africa—						
Algeria	216	...	201	...	...	...
Morocco	123	174	139	143	150	...
South Africa	719	695	690	920	...	...
Australasia—						
Australia	2,523	2,421	2,416	2,438	...	...
New Zealand	404	363	346	337	332	332

(a) The figures for 1913 are not comparable with those of later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908.

CATTLE

(Thousands of Head).

Countries	1913	1919	1920	1921	1922	1923
Europe—						
Germany (a)	20,994	16,318	16,806	16,791	16,309	
Austria (a)	9,160	1,719	2,320			
Belgium	1,849	1,286	1,487	1,515	1,517	
Bulgaria (a)	1,606		2,288			
Denmark (a)	2,254	2,188	2,504	2,591	2,525	2,537
Spain	2,879	3,397		3,718	3,297	
Esthonia (a)		407	442		527	
Jugoslavia (a)	(c) 957		3,684	4,834	4,058	
Finland	(b) 1,606	1,445	1,824	1,792		
France	14,788	12,789	13,217	13,343	13,576	
Great Britain	6,964	7,424	6,713	6,660	6,870	7,017
Greece (a)	(d) 298		659			
Hungary (a)	(d) 7,164		1,971			
Italy	(e) 6,199	6,239				
Latvia			768	800	811	899
Lithuania			865	950		
Luxemburg	102	89			83	
Norway	1,133	1,050	1,095			
Netherlands	2,097	1,969		2,063		
Poland				7,895		
Roumania (a)	(d) 2,667	4,634	4,730	5,521	5,745	
Russia-in-Europe (a)	37,139		27,490	28,805		
Sweden	2,723	2,551	2,736			
Switzerland	1,443	1,433	1,382	1,425		
Czechoslovakia (a)			4,391			
North America—						
Canada	6,656	10,085	9,572	10,206	9,720	9,246
Cuba	3,141	3,966		4,771		
United States	56,527	68,560	67,120	65,587	65,632	66,352
Guatemala	557		297	319		
Jamaica	116	170	158	141	141	
Mexico			2,163			
South America—						
Argentina	25,867	27,721	27,943	28,138	(g) 37,065	
Brazil	30,705		34,271			
Chili	2,084	2,163				
British Guiana	81	79	86	84	74	
Peru	1,000			1,302		
Paraguay	5,249	5,500				
Uruguay	8,193	7,802				
Asia—						
Ceylon	1,484	1,599	1,600	1,386		
Korea	1,211	1,462	1,490			
India	(f) 120,420	(f) 129,591	117,559	116,736	116,665	
Japan	1,389	1,345	1,376	1,437		
Philippines	418	679	761			
Russia-in-Asia	14,216		11,329	9,888		
Siam	2,360	2,542	2,621	2,625	2,864	
Africa—						
Algeria	1,108		1,093			
Egypt	637	505	562	596	585	
Kenya			2,510	2,559	2,814	
Madagascar	5,540	7,278	7,519	7,661		
Morocco	675	1,322	1,494	1,517	1,558	
South Africa	(d) 5,797	5,575	5,975	8,557		
Australasia—						
Australia	11,484	12,711	13,500	14,530		
New Zealand	(d) 2,020	3,035	3,102	3,139	3,323	3,475

(a) The figures for 1913 are not comparable with those of the later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908. (f) including buffaloes. (g) Census.

SHEEP

Thousands

Countries	1913	1919	1920	1921	1922	1923
Europe—						
Germany (a)	5,521	5,341	6,150	5,891	5,566	...
Austria (a)	(b) 2,428	...	454	...	...	...
Belgium	185	...	...	...	...	...
Bulgaria (a)	8,669	...	8,906	...	...	...
Denmark	727	509	540	522	442	374
Spain	16,441	19,337	...	20,522	19,377	...
Esthonia	...	420	530	...	745	...
Jugoslavia (a)	(c) 3,819	...	5,302	6,773	8,462	...
Finland	(b) 1,330	815	1,704	...	1,572	...
France	16,131	9,022	9,406	9,600	9,782	...
Great Britain	23,931	21,534	19.744	20,490	20,122	20,621
Greece	(d) 3,545	...	5,811	...	...	...
Hungary (a)	(d) 8,548	...	1,284	...	...	...
Italy (a)	(e) 11,163	11,754	...	...	...	...
Latvia	...	...	998	1,132	1,167	1,461
Lithuania	...	...	730	750	...	...
Norway	b) 1,398	...	957	...	...	...
Netherlands	842	437	...	668	...	...
Poland	...	...	...	2,178	...	...
Roumania (a)	(d) 5,269	7,791	8,690	11,194	12,321	...
Russia-in-Europe (a)	42,109	...	33,320	34,986	...	...
Sweden	972	1,564	1,568	...	...	...
Switzerland	(d) 161	265	241	245	...	...
Czechoslovakia (a)	...	...	987	...	...	...
North America—						
Canada	2,129	3,422	3,721	3,675	3,264	2,754
United States	51,482	48,866	39,025	37,452	36,327	37,209
Mexico	...	...	1,090	...	...	...
South America—						
Argentina	43,225	45,767	45,995	46,134	(f) 30,672	...
Brazil	10,550	...	7,933	...	...	...
Chili	4,567	4,500	...	...	...	...
Falkland	698	670	646	668	667	...
Paraguay	600	600	...	...	...	...
Peru	...	6,900	...	11,056	...	...
Uruguay	26,286	11,473	...	...	...	...
Asia—						
India	22,934	22,865	22,011	22,075	22,085	...
Philippines	104	168	196	...	...	...
Russia-in-Asia	31,200	...	14,370	10,499	...	...
Turkey-in-Asia	27,095	...	...	...	...	...
Africa—						
Algeria	8,811	...	9,140	...	...	...
Egypt	816	858	930	986	942	...
Kenya	...	...	2,528	2,741	2,464	...
Madagascar	295	221	300	110	...	...
Morocco	3,175	5,080	6,710	6,723	6,319	...
Tunis	729	2,062	2,183	2,038	2,820	...
South Africa	35,808	28,492	26,289	31,730	...	...
Australasia—						
Australia	85,057	75,554	77,898	82,226	...	...
New Zealand	24,182	25,829	23,915	23,285	22,222	22,929

(a) The figures for 1913 are not comparable with those of later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908. (f) census.

SWINE

Thousands

Countries		1913	1919	1920	1921	1922	1923
Europe—							
Germany (a)		25,659	11,518	14,178	15,818	14,683	...
Austria (a)	(b)	6,431	1,107	1,326	...	...	...
Belgium		1,412	770	977	976	1,139	...
Bulgaria (a)	(b)	527	...	1,118	...	...	...
Denmark		1,468	716	1,116	1,430	1,899	2,853
Spain		2,710	4,434	...	5,152	4,229	...
Esthonia		...	150	261	...	272	...
Jugoslavia (a)	(c)	866	...	2,623	3,281	4,887	...
Finland (a)	(b)	422	...	374	375	...	...
France		7,036	4,389	4,942	5,166	5,196	...
Great Britain		2,234	1,936	2,122	2,651	2,450	2,798
Greece (a)	(d)	227	...	416	...	...	...
Hungary (a)	(d)	7,580	...	2,524	...	...	...
Italy	(e)	2,508	2,239	...	...	...	...
Latvia		...	...	481	482	402	484
Lithuania		...	...	1,400	1,500	...	...
Luxemburg		137	89	...	...	89	...
Norway	(b)	334	...	127	...	...	...
Netherlands		1,350	450	...	1,519	...	...
Poland		...	...	...	5,171	...	...
Roumania (a)	(d)	1,021	2,289	2,514	3,132	3,147	...
Russia-in-Europe (a)		12,476	...	11,063	11,951	...	...
Sweden		978	717	1,011	...	...	...
Switzerland	(d)	570	465	546	640	...	...
Czechoslovakia		...	...	2,058	...	...	...
North America—							
Canada		3,448	4,040	3,517	3,905	3,916	4,405
United States		61,178	74,584	59,344	56,097	57,834	63,424
Mexico		...	...	1,654	...	...	...
South America—							
Argentina		2,901	3,199	3,237	3,221	1,437	...
Brazil		18,401	...	16,169	...	...	...
Chili		184	292	...	...	...	...
Asia—							
Korea		701	963	1,078	...	...	...
Formosa		1,322	1,313	1,303	1,281	...	...
Japan		310	470	528	499	...	...
Philippines		2,017	3,130	3,639	...	...	...
Russia-in-Asia		1,756	...	2,761	2,019	...	...
Siam		749	796	...	750	864	...
Africa—							
Algeria		112	...	108	...	...	...
Madagascar		600	221	...	406	...	...
Morocco		16	128	132	115	78	...
South Africa		1,082	724	560	915	...	...
Australasia—							
Australia		801	696	764	960	...	...
New Zealand		349	235	267	350	384	397

(a) The figures for 1913 are not comparable with those of the later years on account of territorial changes.
(b) 1910. (c) Serbia, 1910. (d) 1911. (e) 1908.

In order to show the change in the position of the world's live stock since the war the following statement has been compiled comparing the total numbers of live stock by continents in 1922 with those of 1919. In the cases where, for certain countries, no estimates are available for 1922 or 1919 those for 1921 or 1920 are used in making up the totals. It must also be pointed out that included in the totals given in this statement are the figures for a few countries not mentioned in the above tables on account of the small numbers of their live stock. The figures for countries which have made only one official census or other estimate since 1919 have not been included.

In the case of the United States the figures for 1920 and 1923 have been used as the estimates in that country are made on the 1st of January and really represent the numbers of live stock in the previous year.

Horses.—The countries included in the totals shown in the following table cover respectively 80 per cent for Europe, 50 per cent for South America, 25 per cent for Asia and practically the whole of the stock of horses for the remaining continents.

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	31·7	30·7	+ 1·0	+ 3·0
North America	23·6	24·3	− 0·7	− 2·6
South America	9·4	9·3	+ 0·1	+ 1·5
Asia	4·1	4·0	+ 0·1	+ 2·1
Africa	1·4	1·3	+ 0·1	+10·6
Oceania	2·8	2·8	–	− 0·6
Totals	73·0	72·4	+ 0·6	+ 0·9

It appears from the above table that the variations occurring in the different continents more than balance each other and that in the aggregate an increase is shown. The decrease in North America which is almost entirely due to the figures for the United States with a diminution of 700,000 head is set off by the increases for all other continents. The countries in Europe which show marked development are in the first place Roumania, with an increase of 300,000 head, followed by France, Germany and European Russia, with increases of 200,000, 180,000 and 150,000 head respectively. The reductions in certain other European countries are quite unimportant. The increases in South America, Africa and Oceania are the result of comparatively slight additions in a large number of countries, the increase in Argentina of 150,000 head being alone worthy of special mention.

Cattle.—The countries included in the totals show about 80 per cent of the total head of cattle for Europe, 66 per cent for Asia, 33 per cent for South America and practically the whole for the other continents.

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	94·4	90·4	+ 4·0	+ 4·4
North America	80·7	83·1	− 2·4	− 2·9
South America	28·2	27·8	+ 0·4	+ 1·5
Asia	126·5	127·1	− 0·6	− 0·5
Africa	28·4	25·7	+ 2·7	+10·3
Oceania	17·9	15·8	+ 2·1	+13·3
Totals	376·1	369·9	+ 6·2	+ 1·7

It will be seen from the figures that the reductions shown in the stocks of North America and Asia have been largely set off by the gains in other countries and especially in Europe.

In Europe the heavy losses suffered during the war have been almost made good and, although the complete totals are not available, it may be stated that the pre-war situation has been practically re-established. The most marked increases have taken place in Russia with 1,300,000 head, in Roumania with 900,000 head, in France with 800,000 head and to a less extent in numerous other countries. Very few European countries show any falling off in their total cattle stocks, though mention should be made of the reduction of about 450,000 head in Great Britain and Ireland.

After Europe, in order of importance as to actual increases, come Africa, Oceania and South America. In Africa the increase of 2,700,000 is chiefly distributed among the Union of South Africa, Southern Rhodesia, the Protectorate of South West Africa, Uganda, Nigeria, Madagascar and

French Morocco while in French Sudan and Tunis considerable reductions are recorded Australia and New Zealand in Oceania and Argentina in South America were almost entirely responsible for the increases recorded in these two continents

As regards North America and Asia the reductions in the first case will be found in the figures for the United States and Canada, though for Canada the change is quite inconsiderable, and in the second case in the figures for India

Sheep—The countries for which figures are included in the totals given in the following table cover the total stock of sheep for 75 per cent of Europe and South America for 25 per cent of Asia, for 80 per cent of Africa and for practically the whole of North America and Oceania

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	119 3	110 9	+ 8 4	+ 7 6
North America	40 5	42 4	− 1 9	− 4 5
South America	57 9	53 4	+ 4 5	+ 8 5
Asia	23 4	24 1	− 0 7	− 2 7
Africa	48 7	47 8	+ 0 9	+ 1 9
Oceania	104 4	101 4	+ 3 0	+ 3 0
Totals	394 2	380 0	+14	+ 4 0

The greater part of the increase in head of sheep as also in the case of cattle is to be found in Europe where an addition of nearly eight and a half million head has been recorded which is however still insufficient to bring about the re-establishment of the pre-war position Roumania and Jugoslavia are each responsible for an increase of over three million head Russia for an increase of a million and a half and France for an increase of eight hundred thousand The European increase would have been still more marked but for the reduction of about a million and a half in the stock of sheep in the United Kingdom The additions in South America amounting to four and a half million head are almost all shown by Peru, though it should be observed that the figure for 1919 for this country is really an estimate based on the 1917 return The increase in Oceania is due to the Australian figures, for which only those for 1921 are available, they make up for the falling off in New Zealand and show an aggregate increase of about three million head In North America and the whole continent of Africa the changes are less marked and are caused by a decrease shown in the United States and an increase in French Morocco Asia is the other continent in which the stock of sheep has shown a falling off due almost entirely to the reduction of nearly eight hundred thousand head in India

Swine—The countries of the continents shown in the following table give for Europe about 80 per cent, for Africa 66 per cent and for North America and Oceania practically the whole of their stock in pigs The figures for South America and Asia are however very incomplete and refer respectively to about 14 per cent and 7 per cent of the total stock

Continents	Number		Increase (+) or decrease (−)	
	in 1922 (or 1921)	in 1919 (or 1920)	Actual figures	Percentages
	millions	millions	millions	%
Europe	55 4	44 1	+11 3	+25 5
North America	67 3	62 3	+ 5 0	+ 8 0
South America	3 2	3 2	—	+ 0 7
Asia	3 7	3 5	+ 0 2	+ 5 4
Africa	1 3	1 3	—	− 1 5
Oceania	1 3	0 9	+ 0 4	+44 3
Totals	132 2	115 3	+16 9	+14 6

The figures shown in the above totals refer to about 60 per cent of the approximate world stock of pigs and it is necessary to treat the deductions suggested by the totals with reserve.

At the same time certain interesting variations may be noted for the continents for which relatively complete figures are available.

The total head of pigs shews a marked increase in Europe and while almost all the countries are concerned in this notable development the chief sources of increase are to be found in Germany with an addition of 3.1 million head, Holland and Denmark each with an addition of 1.1 million head, Russia, Roumania and France each with an addition of 800 to 900 thousand head. In North America there is a marked increase in the United States and a small decrease in Canada. In Africa the increase in Madagascar serves to set off a decrease in the Union of South Africa. The very considerable development shewn by the figures for Australia and New Zealand are the chief features in Oceania.

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

AT THE EXCHANGE OF THE DATES INDICATED

PRODUCTS, MARKETS AND DESCRIPTIONS	4 Jan 1924	7 Dec. 1923	5 Jan 1923	Aver 1913
WHEAT.				
(cents per 60 lbs.)				
Canada:				
Winnipeg: No. 1 Manitoba	93	94	106	88
United States:				
Chicago: No. 2 Winter	105½	107	119¼	90¼
Minneapolis: No. 1 North	115	113	123	87⅝
New York: No. 2 Winter	124½	121½	135	97¼
India:				
Karachi: Karachi white	103	104	122	91
Argentina:				
Buenos Aires: Barletta	100	110	122	100
Germany:				
Berlin: Home grown.	-	-	112	128
Belgium:				
Antwerp: Home grown	-	115	121	104
France:				
Paris: Home grown...	132	142	160	146
Great Britain:				
London: English. ..	108	114	116	104
Liv. and Lond.: No. 1 Man	121	120	139	110
Liv. and Lond.: No. 2 Win	n.q.	n.q	139	109
Liv. and Lond.: Pacific	123	126	154	111
Liv. and Lond.: Plate	118	119	140	108
Liv. and Lond.: Australian	122	127	153	117
Liv. and Lond: C.W. Kar	n.q.	122	150	110
Italy:				
Milan: Home grown soft	112	108	154	148
Genoa: Mer Noire....	127	128	-	116
Netherlands:				
Rotterdam: Home grown	n.q.	129	121	115
RYE.				
(cents per 56 lbs.)				
United States:				
Minneapolis: No. 2.....	67	65¼	81½	56¾
Germany:				
Berlin: Home grown...	-	-	96	101
Belgium:				
Antwerp: Home grown.	-	94	97	80
France:				
Paris: Home grown....	95	102	118	97
Netherlands:				
Rotterdam: Home grown	n.q.	102	104	86

OCEAN RATES OF FREIGHT, AND VOYAGES	4 Jan 1924	7 Dec. 1923	5 Jan 1923	Aver. 1913
OCEAN RATES OF FREIGHT				
(WHEAT AND MAIZE).				
(cents per 100 lbs)				
Rumania:				
Danube to U. K	15	17	17	11
Danube to Genoa	13	16	16	10
Russia:				
Azof. Black Sea to U. K	13	13	-	11
Azof Black Sea to Genoa	11	11	—	11
Canada:				
Canada to U. K	15	16	18	14
United States:				
New York to Liverpool	12	14	10	10
North Range to U. K. Cont	14	15	16	13
North Range to Genoa	17	18	22	20
North Pacific Ports to U. K	38	37	38	43
Argentina:				
Plate Down River-U K	24	19	27	18
Plate Up River-U. K.	25	20	29	20
India:				
Karachi to U. K	27	25	28	20
Rangoon to U. K	30	29	34	29
Australia:				
Australia to U. K....	41	37	45	34
COTTON FREIGHTS.				
(cents per 100 lbs.)				
United States:				
New York to Liverpool	25	25	25	30
New Orl. to Liverpool	52	52	50	43

QUESTIONS TO BE SUBMITTED TO THE SEVENTH GENERAL ASSEMBLY OF THE INTERNATIONAL INSTITUTE OF AGRICULTURE, MAY 2, 1924

(*a*) *Reports of the Permanent Committee*

1. General report on the position and work of the Institute. M. Edoardo Pantano, Delegate of Italy, President of the Institute.

2. General Secretary's Report. Presented by M. Bolle, Delegate of Belgium, Chairman of the First Permanent Committee.

3. Report of the Chief of the Service of General Administration. Presented by M. Bolle.

4. Report on the financial position of the Institute. Reporter: M. Van Rijn, Delegate of the Netherlands.

5. Report on the method of payment of contributions by the adhering States. Reporter: M. Van Rijn.

6. Report of the Chief of the Bureau of General Statistics on the work of the Bureau. Presented by M. Asher Hobson, Delegate of the United States of America Chairman of the Second Permanent Committee.

7. Report on the Statistics of Milk and Milk Products. Reporter: M. Fjelstad, Delegate of Norway.

8. Report of the Chief of the Bureau of Agricultural Intelligence and Plant Diseases on the work of the Bureau. Presented by M. Bilbao y Sevilla, Delegate of Spain, Chairman of the Third Permanent Committee.

9. Report on Farm Accountancy Bureaux. Reporter: M. Bilbao y Sevilla.

10. Report on the enquiry on Milk Control. Reporter: M. Fjelstad, Delegate of Norway.

11. Report on the production and consumption of Fertilizers. Reporter: M. Villegas, Delegate of Chili.

12. Report on Agricultural Meteorology. Reporter: M. Louis-Dop, Delegate of France, Vice-President of the Institute.

13. Proposal of the Permanent Committee, requesting the General Assembly, in accordance with the wishes expressed by the International Labour Bureau, to authorize the conduct of an enquiry into the Prevention of Anthrax among Cattle. Reporter: M. Rovira, Delegate of Uruguay.

14. Report of the Chief of the Bureau of Economic and Social Intelligence on the work of the Bureau. Presented by M. Leao, Delegate of Portugal, Chairman of the Fourth Permanent Committee.

(*b*) *Proposals by the British Government*

1. That in view of the provisions of Article 9 (*b*) of the Convention of June 7th, 1905, the Institute should be regarded as the seat and centre of all voluntary international action for the development of agriculture.

2. That international organizations concerned with agriculture or desirous of obtaining the support of agriculturists should be invited to place themselves in communication with the Institute with a view to secure the co-ordination of the arrangements to be made with regard to:—

(*a*) the dates and places of their meetings.

(*b*) the publication of their resolutions, procès-verbaux and reports.

(*c*) the constitution of their permanent bureaux, if any, and

(*d*) any other matters likely to be of interest to agriculturists generally.

3. That the adhering Governments be invited to take the foregoing resolutions into their consideration and to adopt such measures as they may think desirable in order to give effect to them.

(*c*) *Questions submitted by the Government of the United States of America*

The Government of the United States of America is of opinion:

1. That the Institute be authorized to encourage the several governments to conduct comparable national inquiries concerning agricultural economic conditions throughout their respective areas.

2. That the General Assembly consider the adoption of a programme of work for the future development of the Bureau of Economic and Social Intelligence with a view to promoting, when finances permit, increased attention to the study of farm management, land economics, and the marketing of agricultural products.

3. In view of the limited income of the Institute, it is desirable that its efforts be confined to those activities which it is specially competent to perform by reason of its international position created by the treaty of 1905, and that care be exercised

that it does not undertake projects which may be performed as efficiently and inexpensively by the adhering governments acting separately.

4. That consideration be given to the admittance of agricultural and other associations as associate members of the Institute.

5. The United States commends the Institute for its efforts in developing the statistical service and recommends further extension in the use of the telegraph.

6. The United States recommends that American equivalents of weights and measures be used in the publications of the Institute that are to be distributed in the United States and Canada.

7. That the name of the bureau now entitled "Bureau of Agricultural Intelligence and Plant Diseases" be changed to "Bureau of Agricultural Intelligence and Plant Protection."